

**FIRE ESCAPE REPAIRS AND ASSOCIATED
WORK AT THE CARDINAL O'CONNELL, GREEN
MOLLOY, MOODY, AND WASHINGTON SCHOOLS
LOWELL, MASSACHUSETTS**

December 13, 2019



Prepared For:

City of Lowell
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Gale JN 835300

**FIRE ESCAPE REPAIRS AND ASSOCIATED
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SUMMARY OF WORK

SECTION 01 10 00

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

In general, the Contractor and Sub-contractor(s) shall supply all labor, transportation, materials, equipment, temporary protection, tools and appliances necessary for the proper completion of the work, as required in the Specifications, in accordance with good construction practice, and as required by the materials manufacturer. The work includes, but is not limited to, the following items:

General:

- A. Supply all temporary shoring, lighting, barricades, signage and protection necessary to protect the building areas, building systems, building patrons and public. Maintain such protection for the complete duration of the project.
- B. Supply all disposal facilities, transportation and labor necessary to dispose of all demolished materials, dirt and debris off-site in a legal dumping area. The contractor shall obtain all permits necessary to transport and dispose of all materials, rubbish and debris.
- C. Provide temporary fencing around set-up and storage locations. Set-up and storage location should be sufficient for all trades to have adequate area to store materials and equipment. Set-up and storage location area to be coordinated with the Owner.
- D. Perform and complete scope of work in accordance with the project Specifications and Contract Drawings. Coordinate work locations and schedule with the Owner.
- E. Contractor shall provide all lifts, cranes and equipment necessary to access and perform the work.
- F. Cut and point brick masonry mortar joints at locations and as indicated in the Contract Documents. Coordinate with Section 01 22 00 – Unit Prices for additional quantities.
- G. Furnish and install new through-bolts and expansion bolts at locations of deteriorated or missing through-bolts and expansion bolts indicated in the Contract Documents.
- H. Install bollards at locations and as indicated in the Contract Documents.
- I. Furnish and erect formwork and install cast-in-place concrete piers at locations and as indicated in the Contract Documents.
- J. Remove and replace bituminous concrete paving at locations and as indicated in the Contract Documents.

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Cardinal O'Connell School:

- A. Remove and replace individual brick masonry units at locations and as indicated in the Contract Documents. Coordinate with Section 01 22 00 – Unit Prices for additional quantities.
- B. Perform concrete crack repairs at locations and as indicated in the Contract Documents. Coordinate with Section 01 22 00 – Unit Prices for additional quantities.
- C. **Painting Filed Sub-Bid:** Scape, prime and paint 100% of steel fire escape components as indicated in the Contract Documents.
- D. Furnish and install new steel angle components at locations and as indicated in the Contract Documents.
- E. Drill new fastener holes through existing steel components and furnish and install new through-bolts or expansion bolts at locations indicated in the Contract Documents.
- F. Furnish and install replacement stair handrail at locations and as indicated in the Contract Documents.

Green School:

- A. **Painting Filed Sub-Bid:** Scape, prime and paint 100% of steel fire escape components as indicated in the Contract Documents.
- B. Remove and replace deteriorated steel angles at locations and as indicated in the Contract Documents.
- C. Remove and replace damaged stair tread at locations and as indicated in the Contract Documents.
- D. Furnish and install supplemental steel angles and plate components at locations and as indicated in the Contract Documents.
- E. Remove and replace deteriorated or missing J-bolts at locations and as indicated in the Contract Documents.

Molloy School:

- A. **Painting Filed Sub-Bid:** Scape, prime and paint 100% of steel fire escape components as indicated in the Contract Documents.
- B. Furnish and install new steel angle components at locations and as indicated in the Contract Documents.
- C. Drill new fastener holes through existing steel components and furnish and install new expansion bolts at locations and as indicated in the Contract Documents.

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Moody School:

- A. **Painting Filed Sub-Bid:** Scape, prime and paint 100% of steel fire escape components as indicated in the Contract Documents.
- B. Furnish and install replacement grate at locations and as indicated in the Contract Documents.

Washington School:

- A. Perform concrete crack and spall repairs at locations and as indicated in the Contract Documents. Coordinate with section 01 22 00 – Unit Prices for additional quantities.
- B. Furnish and erect formwork and install cast-in-place concrete Sonotube footings at locations and as indicated in the Contract Documents.
- C. **Painting Filed Sub-Bid:** Scape, prime and paint steel fire escape components at locations and as indicated in the Contract Documents. Coordinate with Section 01 22 00 – Unit Prices for additional quantities.
- D. Furnish and install supplemental steel angle and plate components at locations and as indicated in the Contract Documents.
- E. Furnish and install replacement stair stringer and treads at locations and as indicated in the Contract Documents.
- F. Furnish and install new steel angle and plate at locations and as indicated in the Contract Documents.

1.2 PROJECT CONDITIONS

- A. The building will be occupied during the construction period. The Contractor shall take all necessary precautions required to minimize disruption to the building, site occupants and users during the course of the work hereunder. The fire escapes must be accessible at all times during the course of construction for emergency egress. No loud noise, loud radios, etc. will be allowed on the job site(s). The Contractor's full agreement and cooperation in this regard are essential elements to the successful performance of the work under this Contract. The Owner shall have the right, at his/her sole discretion to require removal of any of the Contractor's employees, Subcontractors, agents or assigns that are found in violation of standards of conduct.
- B. CORI Forms: Each employee of the Contractor and Subcontractors that will be present on the project site must be approved by the City of Lowell prior to accessing the site. Approval requirements include filling out a CORI form which will be provided to the Contractor by the City of Lowell. Any employee who has not been approved by the City of Lowell will not be allowed at the project site.
- C. If required, the Contractor shall comply with all requirements of the City of Lowell regarding temporary protection, staging and use of the site.

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- D. All existing items including windows, doors, building, plant life and site features, including but not limited to, pavement, lawns, sidewalks, frames, glazing, flashings, sealants, and trim shall be protected from the effects of all new work.
- E. All temporary protection shall be properly secured and able to withstand all perils of weather and use. At a minimum, protection shall include plywood covering over window and door assemblies below or adjacent to all active demolition/construction areas.
- F. The Contractor shall supply, install and maintain all barriers; protection or warning lines; lights and lighting; and personnel as required to support the structure, fixtures and facilities affected by the work, and to segregate the work area(s) from pedestrian and/or vehicular traffic, as applicable, as well as to prevent damage to the building, its occupants and the surrounding site elements as required. All applicable OSHA and D.L.I. requirement shall be strictly followed by the Contractor, its Sub-Contractors, employees, agents and assigns at all times during the performance of the work under this Contract.
- G. The Contractor shall schedule and execute all work without exposing the interior of the buildings to the effects of weather. Protect the buildings and their occupants and users against such risks, at all times during the course of the work hereunder. All work/weather related damage shall be repaired/replaced to the satisfaction of the Owner at no additional cost to the Owner.
- H. The Contractor shall conform to all requirements of this Specification as well as those of all manufacturers of materials used in performing the work hereunder.
- I. All materials and workmanship shall be of the best quality and the highest standard of construction practice. Refer to the requirements of materials manufacturers and the specifications for handling and installation of all materials used in the work under this Contract.
- J. Protect the buildings and site and any other areas not included in the scope of work. The Contractor shall replace or repair all damage to the buildings or site elements because of the performance of the work hereunder to the satisfaction of the Owner at no additional cost to the Owner.
- K. Supply all labor, equipment, tools, appliances, services, shoring, supports or other items as required to properly support, elevate, and protect fixtures, equipment and facilities affected by the work as required and to properly execute the work.
- L. A disposal plan, materials delivery and storage plan shall be submitted by the Contractor (for Owner and Engineer review and approval) outlining all methods and techniques to be used in the transportation, storage and delivery of debris and materials at the site.
- M. Supply all necessary disposal facilities, transportation and labor in connection therewith as necessary to legally dispose of all demolished materials, dirt and debris

off-site. The Contractor shall obtain all permits required to transport and dispose of all materials rubbish and debris in strict compliance with all legal requirements.

- N. Any open ducts, grills, thermostats, electric boxes or similar fixtures and/or items which could be soiled or adversely affected by the work shall be masked, protected and cleaned as necessary by the Contractor at no additional cost to the Owner.
- O. The Contractor shall cooperate and coordinate with all Contractors working at the site during the course of work hereunder.

1.3 SUBMITTALS

- A. Emergency Response Contacts
- B. Construction Schedule
- C. Schedule of Values
- D. Material Safety Data Sheets (MSDS)
- E. Refer to technical specification sections for material submittals.

1.4 PRECONSTRUCTION CONFERENCE

- A. A Preconstruction Conference will be held with the Owner, Engineer, Contractor and all involved trades to discuss all aspects of the project. The Contractor's foreman or field representative will attend this Conference. The foreman must have 5-years of oversight experience on similar types of projects. The conference will not be held until all shop drawings and submittals have been received and reviewed by the Engineer and Owner.
- B. The Owner shall reserve the right to require an alternate Superintendent and/or Foreman.
- C. Delivery of materials and commencement of construction shall not proceed until the preconstruction conference is held. Delays in obtaining a complete set of submittals shall not extend the Contracted completion date.

1.5 REFERENCES

Applicable publications: Publications listed herein form a part of the Specification to the extent referenced and are indicated in the text by basic designation only. Applicable publications referenced shall be those that were issued and in use at the time of the Bid Submission.

1.6 EMERGENCY RESPONSE

- A. The Contractor shall provide the Owner with after-hours (24 hour), emergency telephone numbers of the Contractor's Superintendent and Foreman.
- B. The Contractor must respond to emergency situations or calls within two (2) hours.

1.7 CONSTRUCTION SCHEDULE

- A. The Contractor shall be responsible for coordinating and scheduling all applicable trades as well as the erection of all staging, delivery of materials and disposal of existing materials scheduled to be removed within the time constraints established in the Contract.
- | | |
|--|--------------------|
| 1. Mobilization at Moody and Washington School | April 13, 2020 |
| 2. Mobilization at Cardinal, Green and Molloy School | June 16, 2020 |
| 3. Substantial Completion | August 14, 2020 |
| 4. Final Completion | September 18, 2020 |
- B. The Contractor's Construction Schedule shall clearly identify the on-site crew foreman and the size of the crew to be utilized. The crew size shall remain consistent and work shall be continuous throughout the project, from start-up to completion.
- C. The Owner shall review the Contractor's Construction Schedule prior to the start of any work. It shall be the responsibility of the Contractor to supply the Owner with written notice, 72 hours in advance, if his work location(s) for a workday is different from the schedule. The Contractor shall update his Construction Schedule weekly, and submit a copy to the Owner for review.
- D. Any work not completed by the beginning of the school year, must be completed outside of classroom hours at no additional cost to the Owner.

1.8 DIMENSIONS AND QUANTITIES

- A. Verify dimensions and quantities in the field prior to bid submission. The Project Plans and Drawings have been compiled from various sources and may not reflect the actual field conditions at the time of construction.
- B. The Contractor is solely responsible for compliance with the project specifications, plans and drawings. Make necessary investigations and take necessary precautions to properly supply, fabricate, and install work.
- C. Additional compensation due to unfamiliarity with project conditions will not be considered.
- D. In case of inconsistency between Drawings and Specifications or within either document, the better quality and/or greater quantity of work shall be provided, as determined by the Owner.

1.9 SCHEDULE OF VALUES

Provide a line item breakdown of construction labor and materials costs for each Specification Section included in these Contract Documents. Additionally, provide line items values for Unit Price Work included in these Specifications. Utilize AIA Forms G703 and G703A to prepare and submit the Schedule of Values.

1.10 WORK RESTRICTIONS

- A. Contractor shall maintain public driveway access at all times. On-Site Work Hours: Work shall be generally performed during normal business working hours of 7:00 a.m. to 6:00 p.m., Monday through Friday, except otherwise indicated.
- B. Contractor shall maintain work areas in an orderly condition and will be responsible for clean-up and removal of debris to the Contractors dumpster on a daily basis. If, in the opinion of the Owner, clean-up is not being performed satisfactorily, the Owner shall, after 24 hours of having notified the Contractor of the same, have the work performed by others and all charges incurred thereby deducted from the next progress payment of the Contractor.
- C. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas where work is directly being performed. Do not disturb portions of the site beyond the areas in which the Work is indicated.
- D. Site Enclosure Fence is required. Contractor is responsible for maintaining the fence and site security during construction. Any damaged or vandalized fence, materials or equipment must be repaired or replaced by the Contractor at no additional cost to the Owner.

1.11 PROGRESS MEETINGS

The Owner shall schedule progress meetings as deemed necessary.

1.12 MATERIAL SAFETY DATA SHEETS

Material safety data sheets (MSDS) shall be submitted in complete sets for all products to be used prior to any work being performed.

1.13 GUARANTEES

- A. Refer to specific Sections of this specification for systems and product warranty requirements. Verify with Manufacturer of proposed systems and products that specified warranty requirements are acceptable, without exception, prior to selecting materials for use on this project.
- B. Submit a full **Contractor Warranty** of the Work to be free from defect in materials and workmanship upon Substantial Completion, and prior to final payment. This Warranty shall be for a period of two (2) years from the date of Substantial Completion, and shall be signed by a Principal of the Contractor's firm, and sealed if a Corporation.
- C. Submit a full **Sub-Contractor Warranty** of the Work to be free from defect in materials and workmanship upon Substantial Completion, and prior to final payment. This Warranty shall be for a period of two (2) years from the date of

Substantial Completion, and shall be signed by a Principal of the Contractor's firm,
and sealed if a Corporation.

1.14 INDEMNIFICATION AND WAIVER OF LIENS

Beginning with the first Application for Payment and thereafter, the Contractor, Sub-Contractor(s) and suppliers shall submit an Indemnification and Waiver of Liens for the construction period covered by the previous application on the form attached as part of the required documentation in any application for payment.

1.15 DUST AND ODOR CONTROL

- A. The Contractor shall coordinate with the Owner the daily shutdown of HVAC intake units in the work areas, which may be affected by construction dust, fumes, odors or air borne debris. If the Owner cannot shut down or cannot permit shut down of the air intakes, it shall be the responsibility of the Contractor to provide control of dusts, odors or fumes as required by the Owner and as necessary to protect the health and safety of the building's occupants.
- B. The Contractor will install clear plastic secured with duct tape over all air intake vents at the beginning of each work day to reduce any construction related odors and dust from entering the building. The Contractor will remove the plastic at the end of each workday.
- C. During removal operations, the Contractor shall be responsible for the containment of all dust, dirt, debris, overspray and/or run-off resulting from the performance of the work. The Contractor shall collect and contain all materials and repair any resulting damage to adjacent materials, building and/or site elements and personal property. Specific attention is drawn to the use of chemicals and cleaners that must be used responsibly in strict compliance with manufacturer's requirements and all applicable regulatory guidelines.
- D. Contractor shall not use building's dumpster for debris associated with this project.

1.16 CLEAN-UP

Restore property of the Owner to its original condition prior to the start of construction. Refer to Section 01 50 00 – Temporary Facilities. General clean-up of the site shall be performed on a daily basis.

- A. Clean, restore and/or replace items stained, dirtied, discolored or otherwise damaged due to the Work, as required by the Owner.
- B. Clean building (interior and exterior), landscaped and parking areas so they are free of trash, debris and dirt caused by, or associated with the Work.
- C. Sweep paved areas clean.
- D. Site clean-up shall be performed daily.

1.17 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: Fire Escape Repairs and Associated Work at the Cardinal O'Connell, Green and Molloy Schools
 - 1. Project Location: Cardinal O'Connell School – 21 Carter Street, Lowell MA 01851
 - 2. Project Location: Green School – 408 Merrimack Street, Lowell MA 01851
 - 3. Project Location: Molloy School – 125 Smith Street, Lowell MA 01851
- B. The Work consists of the following: and per the construction drawings and documents enclosed in this
 - 1. Mobilization.
 - 2. Cleaning and demolition of fire escape components in a method approved by the owner.
 - 3. Repair of fire escape and associated components per drawings, submittals, specifications, addenda, and or sketch's.
 - 4. Cleanup and demobilization.
 - 5. Site Safety/Security.

1.18 WORK UNDER OTHER CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate the Work of this Contract with work performed under separate contracts.
- B. Separate Contract: The Owner reserves the right to perform construction operations at the site. Those operations may be conducted simultaneously with work under this Contract.

1.19 USE OF PREMISES

- A. General: Contractor shall have limited use of Project site as defined by the owner, during construction period.
- B. Contractor is responsible for safety on the job site at all times. Contractor shall take the appropriate actions to assure the areas of construction are secured from the public. Contractor shall construct and/or install temporary fencing, signs and barricades as required assuring a safe and secure environment. Proper barricading of work area is a requirement, to protect people and City property.
- C. Contractor's staging/lay down areas is to be coordinated through the owner. The Contractor is responsible for obtaining any and all building permits and satisfying all requirements for accessing the City streets from the site. Contractor shall coordinate with the local authorities. Contractor is responsible for repairing any damage to staging/lay down area. Contractor shall not place trailers, equipment,

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lay down, storage facilities outside of project site after normal working hours. Contractor shall have no vehicles, trailers, storage containers in any fire lanes or prohibited areas.

1. All permits and fees will be waived.
- D. Contractor shall not restrict the owner's access to the buildings entrances area. If, the Contractor should need to temporarily restrict the owner's access to any areas, the Contractor shall submit a written notice to the owner 72 hours in advance of access restriction.
- E. Contractor to supply temporary facilities (toilets).

PART 2 – PRODUCTS

NOT USED.

PART 3 – EXECUTION

NOT USED.

END OF SECTION

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SECTION 01 22 00

UNIT PRICES

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. Attention is directed to the Contract and General Conditions and all Sections within Division 1 – GENERAL REQUIREMENTS, which are hereby made a part of this Section of the Specifications.
- B. Examine all other Sections of the Specifications for requirements that affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.2 DESCRIPTION OF WORK

This Section contains instructions and references other Contract Documents that relate to Unit Prices. The Owner may elect certain aspects of the work, whose quantities cannot be determined at this time, to be performed or deleted by the General Contractor. If such work items are elected, the Contract price will be adjusted by the Unit Price amount shown for each item in the Bid Forms.

- A. A Unit Price is an amount proposed by Bidders and stated on the Bid Form as a price per unit of measurement for materials or services that will be **added to or deducted** from the Contract Sum by Change Order in the event the estimated quantities of Work required by the Contract Documents are increased or decreased.
- B. The Bidders shall submit with their Bids, prices for the performance of Unit Price work. The general scope of the Unit Price work is defined within this section.
- C. The successful Bidder shall coordinate related work and modify or adjust adjacent work as necessary to ensure that work affected by each Unit Price Item is complete and fully integrated into the project.
- D. The specific quantities of Unit Price Work included in the Base Bid are provided herein. This applies to items whose exact quantities are unknown but are anticipated to exist, for example, deteriorated roof decking.
- E. The specific quantities of Unit Price Work included in the Alternate scope of work are provided herein. This applies to items whose exact quantities are unknown but are anticipated to exist, for example, deteriorated roof decking.
- F. The quantities of Unit Price Work listed in this Section and the bid and contract forms **are in addition to the quantities shown on the Contract Drawings (if any).**

UNIT PRICES

- G. The Unit Prices requested herein shall include a pro-rata share of all costs for materials, labor, equipment costs, overhead, profit, and applicable taxes.
- H. Where not otherwise specified, Unit Prices cover net costs and credits to the Owner for executing authorized changes in the Work. No separate adjustments are made for labor, materials, transportation, handling, storage, overhead, profit, or other related work expenses.
- I. If unit price quantities vary greater than twenty (20) percent above the amounts carried in the Base Bid, the Owner reserves the right to re-negotiate lower unit price costs. The Contractor will be required to notify the Owner once they approach this limit as the work progresses.

1.3 SCOPE OF WORK

- A. The Unit Prices for items of Work, as set forth in the Schedule of Unit Prices, shall be used to determine adjustments to the Contract Amount when changes in the Work involving said items are made in accordance with the Contract Documents.
- B. Materials, methods of installation, and definitions of terms set forth under the various Unit Price items in the Schedule of Unit prices shall be as indicated in the Contract Documents.
- C. The successful Bidder shall coordinate related work and modify or adjust adjacent work as necessary to ensure that work affected by each Unit Price Item is complete and fully integrated into the project.

1.4 APPLICABILITY OF UNIT PRICES

- A. Prior to commencing removal or replacement of materials set forth in the schedule of Unit Prices, the General Contractor shall notify the Owner in sufficient time to permit proper inspection and measurements to be taken. Only quantities that have been approved in writing by the Owner will be considered in the determination of adjustments to the Contract Sum.
- B. Unit Price Work includes providing and installing all accessories and appurtenant work necessary to properly execute the Unit Price Work.
- C. Performance of work not required by the Contract Documents, or which is not authorized by Change Order or Field Order, whether or not such work is set forth hereunder as a Unit Price item, shall not be considered cause for extra payment. The General Contractor will be held fully responsible for such unauthorized work, including the performance of all corrective measures required by the Owner.

1.5 VERIFICATION OF UNIT PRICE QUANTITIES

The following minimum procedures must be included by the Contractor for each of the indicated unit repair items for the duration of the project:

- A. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices and estimated quantities. Methods of measurement and payment for unit prices and estimated quantities are as follows:
1. For work covered by scheduled quantities, notify the Owner and Engineer a minimum of 24 hours in advance of the performance of such work.
 2. Document such work in writing, identifying type of work, quantity and location of work. Submit documentation on General Contractor's letterhead.
 3. All documentation of work covered by scheduled quantities will be subject to verification and approval by the Owner and Engineer.
 4. In order to be considered for payment, documentation for work covered by scheduled quantities shall be submitted within one month of performance of such work. Requests for payment of such work submitted more than one month after the work has been performed will not be accepted.
 5. Only documentation signed and verified by the General Contractor, Trade, and the Owner's Representative will be considered valid. Documentation not signed by all these parties will be considered invalid.
- B. The General Contractor shall contact the Owner and Engineer if a Unit Price quantity is anticipated to be reached prior to exceeding that quantity. No additional costs will be awarded to the General Contractor for additional Unit Price Work without written approval from the Owner and/or Engineer.
- C. The General Contractor must provide safe, adequate, and ample access to the Owner and Engineer for verification of the Unit Price Work throughout the course of construction.
- D. The General Contractor is required to track and record actual placed and completed Unit Price Work throughout the course of construction, and submit a breakdown to the Owner and Engineer on a weekly basis or as requested. The breakdown shall include the following for each Unit Price item:
1. Completed quantity to date
 2. Remaining quantity to date
 3. Percentage of total quantity remaining

1.6 UNIT PRICE SCHEDULE

The following unit prices as defined in the specifications are designated for items of work on the basis of unknown quantities or quantities estimated by the Engineer. These unit prices will be used to add or to deduct from the dollar amounts shown, depending on whether the actual amount is greater or less than the estimated amount. UNIT PRICES GIVEN HEREIN SHALL BE FOR ADDITIONAL WORK ONLY.

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The unit prices listed below are **above and beyond** that shown on the Contract Drawings and shall be included by the General Contractor under the appropriate Base Bid Scope of Work. The General Contractor's Schedule of Values will carry each item under the bid amount selected for this project. Should the unit price work not be performed on this project, the total amount, or remaining amount if portions of unit price work are performed, shall be credited to the Owner.

Base Bid Unit Prices

Section	Item	Estimated Quantity (<u>beyond drawings</u>)	Unit of Measure	Unit Price Dollar/Cents	Total Amount Dollar/Cents
03 60 00	Repair of spalled concrete	2	Square Feet	\$ _____	\$ _____
03 60 00	Repair of cracked concrete (less than 1/4")	2	Linear Feet	\$ _____	\$ _____
03 60 00	Repair of cracked concrete (greater than 1/4")	2	Linear Feet	\$ _____	\$ _____
04 21 00	Remove and replace deteriorated brick masonry unit.	5	Unit	\$ _____	\$ _____
04 21 00	Repainting of brick masonry mortar joints	35	Square Feet	\$ _____	\$ _____
09 90 00	Scrape, prime and paint steel fire escape components	25	Square Feet	\$ _____	\$ _____

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

NOT USED

END OF SECTION

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SHOP DRAWINGS AND SUBMITTALS

SECTION 01 33 00

1.1 DESCRIPTION

This Section contains instructions for submittals and shop drawings required at various stages of the project. The following will be required for all construction components and systems:

- A. List of materials stating manufacturer's name and address, as well as material trade name and manufacturer's designation.
- B. Manufacturer's Catalog Data ("SPEC DATA").
- C. Manufacturer's Installation Instructions.
- D. Samples (as specified in the Technical Sections).
- E. Material Safety Data Sheets (MSDS).
- F. Shop Drawings

1.2 SUBMITTALS

Note: Submit a complete submittal package as specified herein according to the project schedule outlined in the Bid Documents.

- A. Submittal Packages: Provide submittals in bulk and organized by division with a cover letter.
- B. Bid Submission: Refer to Instructions to Bidders regarding information to accompany Bid Forms.
- C. Informational quantities: Provide quantity breakdown for specific portions of the Unit Price work as requested by the Owner. These quantity calculations will be required for allocation of funding prior to award of contract.
- D. Contract Submissions: After award of the Contract by the Owner, provide three (3) copies of the following submittals to the Owner:
 - 1. Proposed Construction Schedule for completion of the Work specified in this project manual.
 - 2. Complete materials list with corresponding manufacturer for each product proposed.
 - 3. Shop Drawings.
 - 4. Manufacturer's Technical Literature with system designations and a sample of the product guaranty.
 - 5. Manufacturer's Instructions.

6. Catalog Data ("SPEC-DATA" Sheets).
 7. Samples of all materials of construction designated as requiring submittals in the applicable technical section including fasteners and sheet metals.
 8. Certificates as approved Applicator by all material manufacturers.
 9. List of proposed storage facilities and their location(s).
 10. Proposed location(s) of dumpsters.
 11. Schedule of Values: Itemize separately labor and materials for each technical section within the Specification as they will be shown on the Application for Payment (use AIA Form G703).
 12. Material Safety Data Sheets (MSDS): Provide MSDS for each proposed product prior to start of work.
 13. Certificate of Dumping Facilities.
 14. Letter of Compliance from all the material manufacturers that all materials proposed for the new construction are acceptable to the material manufacturer for the specified warranties.
 15. Certificates as approved Applicator by all material manufacturers.
 16. General Contractor's Guarantee Form as provided by the Owner in the Contract Forms to be reviewed by Owner.
 17. Certificate of Compliance as provided by the Owner in the Contract Forms.
 18. Program for the containment of cleaning chemicals.
- E. Weekly Submissions: At the end of each week during construction, submit an updated construction schedule showing the amount of completed new work installed, anticipated future work areas, and anticipated completion dates. Update schedule changes.
- F. Close-out Submission: See Section 01 77 00 - Project Close-out for required submittals.
- G. Re-submittals: All re-submittals required from the Contractor shall be submitted within five (5) working days of return of original submittals.
- H. Permits: Prior to start of construction, the Contractor is to provide the Owner with copies of all building permits, licenses, and other documents required by the General Conditions.

1.3 SHOP DRAWINGS

- A. Shop drawings shall be to scale and clearly indicate all components and interfaces.
- B. Original Submittal: Submit one (1) reproducible copy and two (2) prints of shop drawings for review within ten (10) calendar days of Contract award.
- C. Re-submittal: If re-submittal is required, the original reproducible indicating comments and revisions will be returned to the Contractor upon request. Submit a revised reproducible and two prints for review.

- D. Acceptance: Repeat this procedure until acceptance is obtained. One copy of each accepted shop drawing will be returned to the Contractor, at which time the Contractor shall make sufficient copies for the Owner, as well as sufficient copies for his use.
- E. Shop Drawings of an engineering nature shall be sent directly to the Engineer for review, with a copy of the transmittal and one print sent to the Owner.
- F. Transmittal: All reproducibles shall be transmitted rolled in mailing tubes and not folded.

1.4 RECORD DRAWINGS

- A. The Contractor shall provide two (2) hard copies and an electronic copy of all contract drawings showing as-built conditions to the Engineer for approval at the completion of the project. This will be a requisite for final payment.

1.5 SAMPLES

- A. Original Submittal: Two (2) samples, unless otherwise specified, of each item for which samples are required shall be furnished for review. The Engineer must indicate that no exceptions are taken prior to delivery of the materials to the project site. Such samples shall be representative of the actual material proposed for use in the project and of sufficient size to demonstrate design, color, texture and finish when these attributes will be exposed to view in the finished work.
- B. Re-submittals: All rejected samples will be returned upon request, and any or all re-submittals shall consist of two (2) new samples.
- C. Review: Once the Engineer has indicated that no exceptions are taken, one sample so noted will be returned and the Engineer, until completion of the work, will retain the remainder. When requested, all satisfactory samples will be returned for installation, provided their identity is maintained in an approved manner until final acceptance of the project.
- D. Important specific samples are specified in Technical Sections of the Specifications. The Contractor is cautioned to quickly provide specified samples.

1.6 CATALOG DATA

- A. Submittals: One (1) electronic copy of catalog data are required for the original submittal and each subsequent re-submittal along with shop drawings. If approved or not approved, one (1) electronic copy will be returned so noted. If approved, such additional copies may be requested by the Engineer and shall be furnished without additional cost.
- B. Data: Each submittal shall have all pertinent data contained therein that is applicable to the item submitted for approval, adequately and permanently designated.

1.7 MANUFACTURER'S INSTRUCTIONS AND APPROVAL

- A. Where in these Specifications an item is called for to be installed in accordance with the manufacturer's directions, specifications or recommendations, the Contractor shall furnish the Engineer with one (1) electronic copy of said directions, specifications or recommendations, before the item is installed.
- B. The Contractor shall submit evidence that the materials manufacturers have reviewed the project and proposed materials and that the completed installations will be acceptable for the required warranties:

1.8 CERTIFICATES AND GUARANTEES

- A. Certificates of performance, treatment and conformance to specified standards shall be submitted prior to initiating work on the project.
- B. Copies of all guarantees required on the project shall be submitted for review and acceptance as to form prior to initiating work on the project.

1.9 IDENTIFICATION

- A. Each submittal shall have the pertinent data listed below that is applicable to the item submitted for approval, adequately and permanently labeled on the item.
- B. Clearly identify submittals with the following data:
 - 1. Project name and location.
 - 2. Contractor's name and address.
 - 3. Subcontractor's, Vendor's and/or Manufacturer's name and address.
 - 4. Product Identification and Date of Submission.
 - 5. Shop drawing title, drawing number, revision number and date of drawing and revision history.
 - 6. Applicable Contract Drawing(s) and Specification section number.
- C. Catalog Data: Identify each separate catalog, brochure or single page submitted as required above.
 - 1. Catalogs or brochures containing multiple items for review need the identification on the exterior and on each specific item clearly circled, flagged or otherwise identified.
 - 2. If one or more of the multiple items are not accepted in any submittal, additional copies may be required to obtain complete approval. Do not commence Work until every submittal is accepted.

1.10 CONTRACTOR'S RESPONSIBILITY

- A. Representation: Submittal of any shop drawing or catalog data represents that the Contractor has determined and verified field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data, or will do so, and

that he has checked and coordinated each item with other applicable approved shop drawings and the Contract requirements. Certification shall appear on each shop drawing stating that the Contractor has made this check. All drawings without this certification will be returned without examination.

- B. Deviations: Changes on the submitted shop drawings that deviate from the Design Drawings must be brought to the Owners and Designers attention in writing prior to review. Changes must be clearly visible on the shop drawings in the form of written notation, ballooning or highlighting the intended change. A written description for the proposed change must also be included and submitted on company letterhead. Changes to drawings and details not submitted in accordance with these requirements will not be recognized as an approved deviation from the Design of Record. Construction repairs, renovations, or replacements required as a result of shop drawing and submittal deviations that are not documented in accordance with these requirements are subject to removal and/or replacement by the Contractor, at the sole cost of the Contractor.
- C. Commencement: Order, fabricate, and install materials requiring a submittal only after the approval of the submittals related to such items.
- D. Acceptance: Project Work, materials, fabrication and installation shall conform to accepted submittals, shop drawings, and catalog data.
- E. Manufacturer's Information: Where manufacturer's directions, specifications or requirements are called for, the Contractor shall have the responsibility of determining whether such directions, specifications, or requirements may safely and suitably be employed in the work. Notification to the Owner must be made, in writing, if deviations or modifications are necessary for installation safety or proper operations.
- F. Concealed Conditions: If an unspecified or undetailed condition is discovered during the work, the Contractor shall submit scaled shop drawings indicating specific components and configurations planned for use. Provide temporary protection for the duration of the review process. Shop drawings must be approved and accepted by the Owner prior to installation of the related work.
- G. Non-Submittal: Failure by the Contractor to submit shop drawings or submittals in ample time for review or resubmission (if required) prior to the commencement of construction shall not affect the completion date of the contract. Materials or methods of construction utilized in the Work by the Contractor without written acceptance by the Owner shall be done at the Contractor's own risk. Such materials or methods shall be subject to rejection by the Owner.
- H. Timing: Make submittals to the Owner far enough in advance of scheduled dates of preconstruction meeting, mobilization, execution, or installation to provide time required for reviews, for securing necessary approvals, for possible revisions and re-submittals, and for placing orders and securing delivery.

- I. Schedule and allow at least **ten (10) working days** for review by the Owner following receipt of submittal. Contractor shall be responsible for delays resulting from incomplete submittal packages.
- J. Subsequent Reviews: Costs associated with reviews required beyond the first revision review will be paid by Contractor.
- K. Submit a complete set of necessary submittals required by the Contract Documents. Partial submittals may be rejected for non-compliance with the Contract Documents.
- L. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.
- M. The engineer will schedule one working day for submittal review for this project, typically on a Wednesday of each week. Unless a time critical submittal requires immediate attention, all individual, or partial submittal packages will be retained, and not reviewed until multiple items are provided until said designated day. The contractor shall take this into account when scheduling and coordinating submittal and construction activities to prevent delays in their work activities.
- N. Multiple individual submittal reviews or incomplete packages are subject to potential back charges to the contractor due to unreasonable review times which may be required. The contractor is to provide complete submittal packages for technical section.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

NOT USED

END OF SECTION

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TEMPORARY FACILITIES

SECTION 01 50 00

1.1 DESCRIPTION

This Section contains instructions and requirements for the provision and utilization of temporary facilities to protect the Owner's property, the site and construction materials; and daily maintenance and cleanup of the site during the project.

1.2 SET-UP AREAS AND USE OF THE SITE

- A. The Owner shall determine the locations of the Contractor's designated set-up areas. The Contractor may not utilize any other locations unless permission is obtained from the Owner.
- B. The Contractor shall permit the Owner and Engineer access to the staging, work areas and test areas at any time, as required to perform inspections and review mock-ups. The Contractor shall not move or remove staging or access to the work areas until instructed by the Owner and Engineer to do so. Any staging or access to the work areas removed by the Contractor without approval of Owner and Engineer, shall be reinstalled and set-up at the request of the Owner and/or Engineer at no additional cost to the Owner.
- C. Other specific requirements of the Owner will be addressed and outlined at the Pre-Construction meeting to be held prior to the start of work.
- D. Contractor shall provide temporary sanitary facilities in a location agreeable to the Owner. Use of the sanitary facilities within the building is not permitted.
- E. Owner will assist in controlling occupancy. Contractor shall provide and place portable barricades, as coordinated with the Owner, under work areas inside the buildings.
- F. Take precautions necessary and provide equipment, materials and labor to adequately protect previous construction, the building, its contents and occupants, and surrounding landscaped areas from damage due to construction as well as from inclement weather during construction.

1.3 UTILITIES

- A. The Owner, through exterior electrical outlets, if operable, will provide electrical service to the Contractor free of charge. Use shall be limited to construction hours. The Contractor and/or subcontractors shall provide their own electrical generator for welding equipment, HEPA vacuum, and grinding equipment. The Owner reserves the right to charge the Contractor(s) for excessive electrical service usage (i.e., wasteful usage). Should charges be considered, the Owner will notify the Contractor in writing of his intent 48 hours in advance.

- B. Owner will provide water for construction purposes free of charge through exterior water spigots, if operable. The Owner reserves the right to charge the Contractor for excessive or wasteful use. Should charges be considered, the Owner will notify the Contractor in writing of his intent 48 hours in advance. The Contractor shall provide drinking water.
- C. Contractor shall provide all other utilities required by the work.
- D. Sanitary facilities shall be provided by the General Contractor. Use of the building's sanitary facilities is not permitted. Facilities shall be ballasted and secured to prevent overturning and unauthorized access. Units shall be placed in Owner approved locations.
- E. Electrical work, including reinstallation of equipment and other work to be performed by the Contractor, shall be carried out without interference to the building's normal operation. Where work requires interruption of service, the Contractor shall make advance arrangements with the Owner for dealing with such interruption.
- F. Ensure proper and safe operation and maintenance of utility systems within the construction limits, whether these are supplied by the Owner's distribution system or otherwise, until the Owner accepts the work. Maintain and operate appurtenances within the construction area that serve the distribution system, subject to periodic inspection by the Owner's operating personnel. Inspection by any representative or personnel of the Owner shall not relieve the Contractor of his responsibilities in connection with operation and maintenance of these facilities and equipment.

1.4 BARRIERS

The Contractor shall install secure temporary fencing, warning lines, barriers and the like, as required by the Owner, to segregate the construction areas from existing facilities, occupants and the public. Access cannot be interrupted in the construction area.

All work areas shall be provided with barriers at any time that the work area is unattended such as at breaks and during lunch. Fire escapes must remain accessible to building occupants for emergency egress use.

The Contractor shall provide protection above doorways, sidewalks and interior areas below the construction area. The Contractor shall also be required to conform to OSHA requirements. The Contractor shall provide guard lights on all barriers and all lighting necessary to prevent vandalism of work and storage areas. The Owner is not responsible for Contractor's losses due to damage or theft by vandals.

1.5 CONTAINMENT DURING CONSTRUCTION OPERATIONS

During construction operations, the Contractor is responsible for the containment of all dust, dirt, debris, overspray and run-off resulting from the work. The Contractor shall collect and contain all materials and repair any resulting damage to adjacent surfaces, window finishes, site fixtures or personal property.

1.6 TEMPORARY PROTECTION

- A. Provide suitable Owner-approved temporary protection to prevent the entrance of debris, obstructions, and water infiltration into the building. Provide warning signs to reroute personnel around areas of dangerous work.
- B. Avoid traffic on completed work areas. Coordinate work to prevent this situation. Should temporary access be required, provide temporary protection for trafficked areas.
- C. Protect materials scheduled for reuse from damage by placing them in labeled containers or wrappings stored in a weathertight trailer.
- D. Provide temporary protection such as plywood and tarps for streets, drives, curbs, sidewalks, landscaping and existing exterior improvements during all phases of the project.

1.7 DEBRIS REMOVAL

- A. The Owner shall designate crane and refuse container locations. This area shall be sectioned off with proper warning lines.
- B. Removed materials shall not be thrown freely from the fire escape and shall be lowered to the ground in suitable containers or in an enclosed chute, in order to reduce the spread of dust and other debris.
- C. Supply adequate covered receptacles for waste, debris and rubbish. One receptacle will be allowed on site at a time, and must be immediately removed from the site when full. Clean the project area daily and prior to moving the receptacle to another location on the site. Locations shall be as permitted by the Owner. Disposal shall be off-site in a legal dump authorized to accept construction demolition solid wastes. The Contractor shall be responsible for receptacle-related damage to site grounds.

1.8 VOLATILE MATERIALS

- A. The Contractor is reminded that the adhesives, solvents, bitumens, etc., are highly volatile and flammable materials. Do not store these materials, contaminated tools, applicators or rags, on or within the buildings. Do not transport materials through the building. Take precautions and closely follow the Specification requirements for fire protection on site during construction.
- B. Locate and use flame-heated equipment so as not to endanger the structure, other materials on site, or adjacent property. Locate and use flame-heated equipment in specific areas approved by the Owner. Do not relocate flame-heated equipment without prior approval from the Owner.

1.9 FIRE PROTECTION

- A. Provide necessary temporary fire protection for the buildings, their contents and materials during construction. Do not store combustibles inside the buildings. Store adhesives, caulks and cleaning solvents away from the building using a method approved by local fire officials. Should cutting, burning or welding be necessary, provide a fire watch during operations and for four hours minimum after completion of the operations.
- B. Do not use open flames near adhesives, caulks or cleaning solvents as they will readily ignite. Rags soaked with cleaning solvent shall not be discarded in the dumpsters, but shall be stored in a separate metal receptacle and removed from the site daily.
- C. Comply with local fire codes and obtain permits necessary from the local fire department. Provide a copy to the Owner. Provide recently tested, fully charged fire extinguishers around the storage area, rubbish receptacle and two fire extinguishers within 50 feet of the Work.

1.10 NOTIFICATION

Notify the Owner at least 72 hours in advance of the desire to extend, connect, disconnect, or turn on or off HVAC, steam, electric, water or other service from the Owner's supply systems. Authorized representatives of the Owner shall witness the actual operation. Plumbing, heating and electrical work, including installation of equipment and any other work to be performed by the Contractor, shall be carried out without interference with the Owner's normal operation. Where work requires interruption of a service, make advance arrangements with the Owner for dealing with such interruption. All disconnections, extensions and reconnections of HVAC, steam, electric, water or other service shall be performed by a licensed and certified technician capable of completing the work.

1.11 CRANES AND HOISTING EQUIPMENT

All hoisting equipment and machinery required for the proper and expeditious prosecution and progress of the work shall be furnished, installed, operated and maintained in a safe condition by the Contractor. All costs for hoisting operating services shall be borne by the Contractor including street permits and police details.

1.12 ACCESS TO THE WORK

If the Contractor needs interior building access, he shall provide a request to the Owner with 48 hours notice. Access to the site shall be as directed by the Owner.

Work locations must be closed to the public. Security procedures must be established so that entry to work areas is restricted to authorized personnel only.

1.13 VEHICLES

The Owner shall designate acceptable areas for the locations of the Contractor's vehicles.
No other areas may be utilized without the Owner's permission.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

NOT USED

END OF SECTION

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PROJECT CLOSE-OUT

SECTION 01 77 00

PART 1 - GENERAL

1.1 DESCRIPTION

This Section contains requirements for items to be completed by the Contractor prior to Owner's final acceptance.

1.2 SUBSTANTIAL COMPLETION

Substantial completion for this project is defined as the date when the Owner and Owner's Representative mutually agree and certify that all project related work has been properly installed and completed in a manner conforming to the Contract Documents. Work specified within the Contract Documents which has not been performed or has been performed in a manner which does not conform with the Contract Documents shall be deemed as not achieving substantial completion.

1.3 CLOSE-OUT INSPECTION

Notify Owner or Owner's Representative in writing that the Work of the project has been completed and is ready for inspection. After work is deemed substantially complete, and only minor repair items remain, the Owner's Representative shall tour the project site and compile a list of these items. Minor repair items are those items which have been properly installed and are functional, but which require cosmetic repair or cleaning which does not affect the systems' integrity. A copy of the list shall be sent to the Contractor who shall then correct each item. The Contractor shall certify completion of the itemized repair list to the Owner's Representative and request a re-inspection in writing. Should the Contractor delay correction of the list of items for more than 30 days, the Owner may have the deficiencies repaired by others at the Contractor's expense.

1.4 PUNCH LIST REINSPECTION

After providing written notification to the Owner and Engineer that the punch list work has been completed, the Owner and Engineer will perform one (1) re-inspection. Should additional re-inspections be required due to punch list items which are not completed or improperly completed, the costs of these re-inspections will be assessed to the Contractor as liquidated damages.

1.5 MATERIALS MANUFACTURER'S INSPECTION

After the re-inspection by the Owner's Representative, the Materials Manufacturer shall be required to tour the site. Announce the Materials Manufacturer's site inspection to both the Owner and Owner's Representative 72 hours prior to its occurrence. Provide the Materials Manufacturer's Representative written reports to the Owner indicating the determination of

whether the materials have been installed as intended by the Manufacturer to the Owner. Items determined not so installed shall be removed and reinstalled so as to comply with the Materials Manufacturer's intended use, within the parameters of this Specification at no additional cost to the Owner. Issuance of Warranty prior to Materials Manufacturer's inspection is prohibited.

1.6 PROJECT CLOSE-OUT SUBMITTALS

When both the Owner's Representative and the Materials Manufacturer's Representative agree that the Contractor has performed according to the Specifications and has installed the materials to the satisfaction of the Materials Manufacturer, submit the following:

- A. Specified Contractor's and Materials Manufacturer's Warranties and Guaranties.
- B. Executed Punch List Inspection Letter.
- C. Consent of Surety to Final Payment (AIA Form G707).
- D. Lien Releases from Contractor, subcontractor and suppliers (AIA Forms G706, G706A).
- E. Contractor's Affidavit of Payment of Debts and Claims.
- F. Final Application and Certificate for Payment.
- G. As-built Drawings.
- H. Other documents which may be specifically required by the City of Lowell or the Engineer.

1.7 RETAINAGE RELEASE

The Owner will withhold retainage for a period of up to one (1) year after when all guaranties, warranties, certificates of compliance, and lien releases have been received by the Owner and the work has been accepted by the Owner as complete.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

NOT USED

END OF SECTION

CONCRETE FORMWORK

SECTION 03 10 00

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. The General Conditions and all parts of the Bid and Contract Documents are made part of this Section as if fully repeated herein.
- B. Refer to Division 1, Sections 01 11 00 to 01 77 00 for additional information.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Cast-In-Place Concrete – Section 03 30 00
- B. Asphalt Paving – Section 32 12 16

1.3 SCOPE OF WORK

In general, the Contractor shall supply all labor, transportation, materials, equipment, temporary protection, tools and appliances necessary for the proper completion of the work, as required in the Specifications, in accordance with good construction practice, and as required by the materials manufacturer. The work includes, but is not limited to, the following items:

General:

- A. Furnish, erect, and remove after use, all concrete formwork and accessories, as required for cast-in-place concrete work.

1.4 REFERENCES

- A. Comply with applicable requirements of the following standards (current edition). Where these standards conflict with other requirements, the most restrictive requirements shall govern.
 - 1. AMERICAN CONCRETE INSTITUTE (ACI)
 - 2. ACI 301 Specifications for Structural Concrete
 - 3. ACI 318/318R Building Code Requirements for Structural Concrete and Commentary
 - 4. ACI 347R Guide to Formwork for Concrete
 - 5. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
 - 6. ASTM C578 Rigid, Cellular Polystyrene Thermal Insulation
 - 7. AMERICAN HARDBOARD ASSOCIATION (AHA)
 - 8. AHA A135.4 Basic Hardboard

9. DEPARTMENT OF COMMERCE (DOC)
10. DOC PS 1 Construction and Industrial Plywood
11. Massachusetts State Building Code

1.5 SUBMITTALS

- A. The following shall be submitted in accordance with Section 01 33 00 Shop Drawings and Submittals:
1. Data: Design analysis and calculations for form design and methodology used in the design.
 2. Manufacturer's data, including literature describing form materials, accessories, and form releasing agents.
 3. Drawings: Drawings showing details of formwork including, joints, supports, studding and shoring and the sequence of form and shoring removal.
 4. Instructions: Manufacturer's recommendation on method and rate of application of form releasing agents.

1.6 DESIGN

- A. Formwork shall be designed in accordance with methodology of ACI 347R for anticipated loads, lateral pressures and stresses.
- B. Forms shall be capable of withstanding the pressures resulting from the placement and vibration of concrete, in addition to applicable and anticipated construction loads.

1.7 QUALITY CONTROL

- A. Unless otherwise specified herein, or indicated on the drawings, concrete formwork construction and materials shall conform to ACI 301, 318, and 347, and the following tolerances:

TABLE 1: TOLERANCES FOR FORMED SURFACES			
1.	Variations from the plumb.	In any 10 feet of length.	¼ inch
a.	In the lines and surfaces of piers, walls.	Maximum for entire length and in arises.	1 inch
2.	Variation from the level or from the grades indicated on the drawings.	In any 10 feet of length. In any bay or in any 20 feet of length.	¼ inch ¾ inch
3.	Variation in the thickness of slabs and walls.	Minus. Plus.	¼ inch ½ inch
4.	Footings.		

TABLE 1: TOLERANCES FOR FORMED SURFACES			
a.	Variation of dimensions in plan. When formed: When placed against unformed excavation:	Minus. Plus. Plus.	½ inch 2 inches 3 inches
b.	Misplacement of the eccentricity.	2 percent of the footing width in direction of misplacement. But not more than	2 inches
c.	Reduction in thickness.	Minus.	5 percent of specified thickness

- B. The maximum deflection of form facing materials at concrete surfaces exposed to view shall be L/240 of span.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

- A. Forms are to be Class A finished surfaces shall be plywood panels conforming to DOC PS 1, Grade B-B concrete form panels, Class I or II. Other form materials or liners may be used, provided the smoothness and appearance of the concrete produced will be equivalent to that produced by the plywood concrete form panels.
- B. Form ties shall be factory-fabricated metal ties, shall be of the removable or internal disconnecting or snap-off type, and shall be of a design that will not permit form deflection and will not spall concrete upon removal. Solid backing shall be provided for each tie. Except where removable tie rods are used, ties shall not leave holes in the concrete surface less than ¼ inch, nor more than 1 inch deep and not more than 1 inch in diameter. Removable tie rods shall not be more than 1-½ inches in diameter.
- C. Form releasing agents shall be commercial formulations that will not bond with, stain or adversely affect concrete surfaces. Agents shall not impair subsequent treatment of concrete surfaces, depending upon bond or adhesion, nor impede the wetting of surfaces to be cured with water or curing compounds.
- D. Form release agents shall be fully compatible with project specified foundation waterproofing, damp-proofing, vapor barriers and sealants.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Forms shall be mortar tight, properly aligned, and adequately supported to produce concrete surfaces meeting the surface requirements specified in Section 03 30 00 CAST-IN-PLACE CONCRETE. Forms shall conform to construction tolerances given in TABLE 1, "Tolerances for Formed Surfaces", of this Section, Part 1.
- B. Where concrete surfaces are to have a Class A or Class B finish, joints in form panels shall be arranged as approved. Where forms for continuous surfaces are placed in successive units, care shall be taken to fit the forms over the completed surface so as to obtain accurate alignment of the surface and to prevent leakage of mortar.
- C. Forms shall not be reused if there is any evidence of surface wear and tear, or defects which would impair the quality of the surface. Surfaces of forms to be reused shall be cleaned of mortar from previous concreting and of all other foreign material before reuse.
- D. Form ties that are to be completely withdrawn shall be coated with a non-staining bond breaker.
- E. Formwork and form ties shall not be placed in a location or manner which would cause interference with or impede the performance of reinforcing, embedded items or water stops.

3.2 CHAMFERING

- A. Except as otherwise shown, external corners that will be exposed shall be chamfered, beveled or rounded by moldings placed in the forms.

3.3 COATING

- A. Forms for Class A and Class B finished surfaces shall be coated with a form releasing agent before the form or reinforcement is placed in final position. The coating shall be used as recommended in the manufacturer's printed or written instructions.
- B. Forms for Class C and D finished surfaces may be wet with water, in lieu of coating immediately, before placing concrete; except that in cold weather with probable freezing temperatures, coating shall be mandatory.
- C. Surplus coating on form surfaces and coating on reinforcing steel and construction joints shall be completely removed before placing concrete. Insofar as practical, form release agents shall be applied to form surfaces prior to placing the forms into position.

3.4 REMOVAL OF FORMS

- A. Forms shall be removed in a manner that will prevent damage to the concrete and will ensure the complete safety of the structure. Formwork for footings, walls and other parts not supporting the weight of concrete may be removed when the concrete has attained sufficient strength to resist damage from the removal operation, but not before at least 24 hours has elapsed since concrete placement.
- B. Supporting forms and shores shall not be removed from walls until the structural units are strong enough to carry their own weight and any other construction or natural loads.
- C. In no case will supporting forms or shores be removed before the concrete strength has reached 70 percent of design strengths, as determined by field cured cylinders or other approved methods. This strength shall be demonstrated by job-cured test specimens and by a structural analysis, considering the proposed loads in relation to these test strengths and the strength of the forming and shoring system.
- D. The job-cured test specimens for form removal purposes shall be provided in numbers as directed and shall be in addition to those required for concrete quality control. The specimens shall be removed from molds at the age of 24 hours and shall receive, insofar as possible, the same curing and protection as the structures they represent.

END OF SECTION

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CAST-IN-PLACE CONCRETE

SECTION 03 30 00

PART 1 - GENERAL

1.1 IN GENERAL

- A. The General Conditions, and all parts of the Bid and Contract Documents are made part of this Section as if fully repeated herein.
- B. Refer to Division 1, Sections 01 11 00 to 01 77 00 for additional information.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Concrete Formwork – Section 03 10 00
- B. Miscellaneous Metals – Section 05 50 00
- C. Asphalt Paving – Section 32 12 16

1.3 SCOPE OF WORK

In general, the Contractor shall supply all labor, materials, equipment, temporary protection, tools and appliances necessary for the proper completion of the work in this section, as required in the specifications and in accordance with good construction practice. The work under this Section includes, but is not limited to, the following:

General:

- A. Install cast-in-place pier at the base of new bollards at locations and as indicated in the Contract Documents. Coordinate with Section 05 50 00 – Miscellaneous Metals and Section 32 12 16 – Asphalt Paving.
- B. Clean all areas affected by the work to the satisfaction of the Owner.

Washington School:

- A. Install cast-in-place Sonotube footings at the base of the new stair stringers at locations and as indicated in the Contract Documents. Coordinate with Section 05 50 00 – Miscellaneous Metals and Section 32 12 16 – Asphalt Paving.

1.4 JOB CONDITIONS

- A. The Contractor shall provide all protection, barriers, and guards necessary to segregate his work area and the areas below, from pedestrian and vehicular traffic. Also protect existing buildings, landscaping and paved areas from damage.

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- B. The Contractor shall be responsible for securing and protecting his/her equipment, materials and tools (as well as partially completed construction) from wind blow-off and vandalism or abuse.
- C. Environmental Requirements: Do not place concrete during rain, sleet or snow unless adequate protection is provided and the Engineer's approval is obtained. Do not allow rainwater to increase the mixing water or damage the surface finish.
- D. Cold Weather Concreting:
1. Conform to ACI 306 latest edition, "Recommended Practice for Cold Weather Concreting."
 2. Temperature of concrete when placed shall not be less than the following:

Minimum Concrete Temperature °F
Sections with Least Dimension

Air Temp (°F)	Under 12"	12" and Over
30 to 45	60	50
0 to 30	65	55
Below 0	70	60

3. When placed, heated concrete shall not be warmer than 80° F.
 4. Prior to placing concrete, all ice, snow, and surface and subsurface frost shall be removed, and the temperature of the surfaces to be in contact with the new concrete shall be raised to the temperature specified above for placing.
 5. Protect the concrete from freezing for four (4) days after placement.
 6. Heated enclosures shall be strong and windproof to ensure adequate protection of corners, edges and thin sections. Do not permit heating units to locally heat or dry the concrete. Do not use combustion heaters during the first 24 hours unless the concrete is protected from exposure to exhaust gases which contain carbon dioxide.
 7. When air temperature gets below 25 degrees F, two (2) additional ASTM C39 cylinders shall be made and located at the site in a location and under conditions which will match the placement that they represent. After seven (7) days of site conditions, the cylinders shall be placed in a steam room for twenty-one (21) days.
- E. Hot Weather Concreting:
1. Conform to ACI 305 latest edition, "Recommended Practice for Hot Weather Concreting." Take precautions when the ambient air temperature is 90° or above. Temperature of the concrete when placed shall not exceed 80° F. Cool forms and reinforcing to a maximum of 90° F by spraying with water prior to placing concrete. Do not use cement that has reached temperatures in excess of 170° F.

- F. Prevent plastic shrinkage cracking due to rapid evaporation of moisture. Do not place concrete when the evaporation rate (actual or anticipated) equals or exceeds 0.20 pounds per square foot per hour, as determined by Figure 2.1.4 of ACI 305.
 - 1. Set-retarding admixtures may be used with Engineer's approval when the ambient air temperature is 90°F or above to off-set the accelerating effects of high temperatures.

1.5 QUALITY ASSURANCE

- A. Reference Standards: Except as modified or supplemented herein, all concrete materials, placing, furnishing, curing and all other appurtenant work shall meet the requirements of the latest edition of the following Standard Specifications. Pertinent portions of the reference standards are included herein. Refer to the standards for detailed requirements.
 - 1. AMERICAN CONCRETE INSTITUTE STANDARDS (ACI)
 - a. 301 - Standard Specifications for Structural Concrete for Buildings.
 - b. 304 - Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete.
 - c. 316 - Building Code Requirements for Reinforced Concrete
- B. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
 - 1. ATMS C109 "Test Method for Compressive Strength of Hydraulic Cement Mortars"

1.6 SUBMITTALS

- A. Refer to Section 01 33 00 – Submittals and Shop Drawings. Supplement with the following:
- B. Test Reports: Perform and submit test reports for the following products in accordance with above general reference standards and specific standards set forth hereafter.
- C. Proposed Mix Design:
 - 1. Prior to commencing concrete work submit and obtain Engineer's approval of certified test report describing proposed concrete mix design, including:
 - a. Fine Aggregates - Source, type, gradation, deleterious substances and saturated surface dry specific gravity (ASTM C128).
 - b. Coarse Aggregates - Source, type, gradation, deleterious substances and saturated surface dry specific gravity (ASTM C127); soundness (ASTM C88).
 - c. Ratio of fine to total aggregates.
 - d. Weight (surface dry) of each aggregate per cubic yard.

- e. Total water content (gallons) per cubic yard, water/cementitious materials ratio and proposed source.
- f. Slump on which design is based, ASTM C143.
- g. Brand, type and quantity of cement.
- h. 7-day and 28-day compressive strength results from each of two sets of test cylinders for each proposed mix.
- i. Air Content, ASTM C231 or ASTM C173.
- j. Certifications of Chloride Content of admixtures.
- k. Water soluble chloride ion content of concrete, ASTM G1218.
- l. Proportions of all ingredients including all admixtures added either at time of batching or at job site.

D. Cylinder Compression Test Reports:

- 1. Submit two copies of certified test reports to Engineer indicating results of tests required in Part 3 hereof.

E. Ready-Mix Delivery Tickets:

- 1. Submit one copy to the Engineer of ready-mix delivery ticket for each load delivered.
- 2. Include identification and quantity of concrete supplied.
- 3. Include time loaded and time unloaded.
- 4. Reading of revolution counter at times initial water added, supplemental water added, and unloading completed.
- 5. Amounts of initial and supplemental water added, and name of individual authorizing supplementing water.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store cement in watertight enclosures and protect against dampness, contamination and warehouse set.
- B. Stock pile aggregates to prevent segregation, or contamination with other materials or other sizes of aggregates. Use only one supply source for each aggregate stockpile.
- C. Store admixtures to prevent contamination, evaporation or damage. Protect liquid admixtures from freezing or harmful temperature ranges. Agitate emulsions prior to use.
- D. Store rubber and plastic materials in a cool place away from direct sunlight.

1.8 GUARANTEES

- A. Upon completion of the work and prior to final payment, the Contractor shall submit a guarantee of his work as free from defect in materials and workmanship. The

guarantee shall be for a period of two (2) years. The guarantee shall be signed by an officer of the Contractor's firm and sealed if a corporation.

PART 2 - PRODUCTS

2.1 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II.
- B. Aggregate: ASTM C 33, uniformly graded, from a single source. Maximum aggregate size = 1 ½" at foundations and ¾" at slabs and curbs.
- C. Water: ASTM C 94.
- D. Air-Entraining Admixture: ASTM C 260.
- E. Water-Reducing Admixture: ASTM C 494, Type A.
- F. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
- G. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
- H. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
- I. Coloring pigment shall be a concentrated pigment specially process for mixing into concrete and conforming to ASTM C979. Provide color chart for Owner review. Provide mixed samples of up to four (4) colors for Owner review.

2.2 CONCRETE PRODUCTION

- A. Concrete Mixes, General - Prepare design mixes, proportioned according to ACI 211.1 and ACI 301-05.
- B. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch ticket information.
- C. Concrete shall have a minimum compressive strength of 4000 psi for piers and 4000 psi for sonotube footings at 28 days with a slump of no more than 4" and air entrainment of 4 ½ to 7 ½%.
- D. Proportioning: Proportion ingredients to produce a well-graded mix of high density and maximum workability consistent with approved mix design and subject to the characteristics as specified in the Contract Drawings.
- E. Mixing:
 - 1. Central Mixed Concrete - 1 minute for mixer capacities one cubic yard or less plus 15 seconds for each cubic yard or fraction thereof of additional capacity.

2. Truck Mixed Concrete - 100 revolutions after the introduction of all ingredients.

F. Tempering and Control of Mixing Water:

1. Mix concrete only in quantities for immediate use. Do not use concrete which has stiffened due to initial set or concrete which cannot be discharged within 1-1/2 hours or 300 revolutions of the mixer drum after the introduction of the mixing water.
2. Water may be added to concrete arriving at the site, only if neither the maximum slump nor the maximum water cement ratio is exceeded. Provide additional cement if required by the addition of water to maintain water cement ratio within specified limits. Obtain Engineer's approval prior to adding water or cement.
3. Incorporate any added water or cement by additional mixing equal to half the total mixing required.

2.3 CURING MATERIALS

- A. Impervious-sheet materials shall conform to ASTM C 171, type optional.
- B. Burlap and cotton mat used for curing shall conform to AASHTO M 182, Class 2.

2.4 WATER

- A. Water for mixing and curing shall be fresh, clean, potable, and free of injurious amounts of oil, acid, salt, or alkali, except that non-potable water may be used if it meets the requirements of ASTM C94.

2.5 EMBEDDED ITEMS

- A. Embedded items shall be of the size and type indicated or as needed for the application.
- B. All other embedded items shall also be securely anchored, and protected from damage or displacement.

2.6 JOINT MATERIALS

- A. Expansion joint fillers shall be preformed materials conforming to ASTM D 1751. Expansion joint fillers shall be a closed-cell, non-absorbent, synthetic foam, and as recommended by the sealant manufacturer. Filler shall be totally compatible with sealant, primer, and substrates. Backers shall conform to the requirements of ASTM C 962, Type A, such as Ceramar as manufactured by W.R. Meadows, Expansion Joint Filler as manufactured by BASF-Sonneborn, or approved equal.
- B. Expansion joint sealant shall be a two-component, traffic grade polyurethane elastomeric sealant such as Sikaflex 2C NS TG as manufactured by Sika Corporation or an approved equal.

PART 3 - EXECUTION

3.1 PREPARATION FOR PLACING

- A. Before commencing concrete placement, the following shall be performed:
- B. Surface Preparation:
 - 1. Surfaces to receive concrete shall be clean and free from frost, ice, mud, and water.
 - 2. Earth (subgrade, base, or subbase courses) surfaces upon which concrete is to be placed shall be clean, damp, and free from debris, frost, ice, and standing or running water. The foundation shall be well drained and shall be satisfactorily graded and uniformly compacted.
 - 3. Rock surfaces upon which concrete is to be placed shall be free from oil, standing or running water, ice, mud, drummy rock, coating, debris, and loose, semi-detached or unsound fragments. Joints in rock shall be cleaned to a satisfactory depth, as determined by the Engineer, and to firm rock on the sides. Immediately before the concrete is placed, rock surfaces shall be cleaned thoroughly by the use of air-water jets or sandblasting as specified below for Previously Placed Concrete. Rock surfaces shall be kept continuously moist for at least 24 hours immediately prior to placing concrete thereon. All horizontal and approximately horizontal surfaces shall be covered, immediately before the concrete is placed, with a layer of mortar proportioned similar to that in the concrete mixture. Concrete shall be placed before the mortar stiffens.
 - 4. Concrete surfaces to which other concrete is to be bonded shall be abraded in an approved manner that will expose sound aggregate uniformly without damaging the concrete. Laitance and loose particles shall be removed. Surfaces shall be thoroughly washed and shall be moist but without free water when concrete is placed.
- C. Equipment:
 - 1. Transporting and conveying equipment shall be in-place, ready for use, clean, and free of hardened concrete and foreign material.
 - 2. Equipment for consolidating concrete shall be at the placing site and in proper working order.
 - 3. Equipment and material for curing and for protecting concrete from weather or mechanical damage shall be at the placing site, in proper working condition, and in sufficient amount for the entire placement.
- D. When hot, windy conditions during concreting appear probable, equipment and material shall be at the placing site to provide windbreaks, shading, fogging, or other action to prevent plastic shrinkage, cracking, or other damaging drying of the concrete.

- E. Before placement of concrete, care shall be taken to determine that all embedded items are firmly and securely fastened in place as indicated on the drawings, or required. Conduit and other embedded items shall be clean and free of oil and other foreign matter such as loose coatings or rust, paint, and scale. The embedding of wood in concrete will be permitted only when specifically authorized or directed. Voids in sleeves, inserts, and anchor slots shall be filled temporarily with readily removable materials to prevent the entry of concrete into voids. Welding shall not be performed on embedded metals within 2 feet of the surface of the concrete. Tack welding shall not be performed on or to embedded items.
- F. Forms shall be in place, cleaned, coated, and adequately supported, in accordance with Section 03 10 00, CONCRETE FORMWORK.

3.2 INSTALLATION

- A. Conveying:
 - 1. Convey concrete from mixer to final position as rapidly as practical without segregation or loss of material.
 - 2. Use only metal or metal lined chutes with maximum length of 20 feet, maximum slope 1 vertical to 2 horizontal and minimum slope 1 vertical to 3 horizontal.
 - 3. Provide a hopper at the end of long belt conveyors and chutes not meeting the above requirements.
 - 4. Conveying by pumping methods shall conform to ACI 304. Maximum loss of slump, 2 inches. Do not use pipe made of aluminum or aluminum alloy to convey concrete. Should pumping be required for this project, all costs for pumping shall be borne by the Contractor. No additional compensation will be considered for any pumping costs.
- B. Depositing:
 - 1. Deposit concrete in a continuous operation until the section is completed. Regulate rate of placement so concrete remains plastic and flows into position.
 - 2. Maximum height of concrete free fall is 4 feet.
 - 3. All concrete shall be placed within 2 hours of batching. All concrete on site more than 2 hours from batching time shall be rejected and sent back to the plant.
- C. Consolidation:
 - 1. Use mechanical vibrating, rodding or spading for consolidation. Conform to 309-72, "Recommended Practice For Consolidation of Concrete."
 - 2. Do not use vibrators to transport concrete in forms.
 - 3. Minimum vibrator speed 8000 rpm.

4. Vertically invert vibrators at points 18 inches apart to a depth sufficient to penetrate 6 inches into the preceding layer. Vibrate each location for a length of time to obtain adequate consolidation (generally 5 to 15 seconds).

D. Embedments:

1. Accurately position and securely fasten all anchor bolts, castings, steel shapes, conduit, sleeves, and other materials to be embedded in the concrete.
2. Embedments shall be clean when installed. Remove concrete spatter from all surfaces not in contact with concrete.

E. Wash-out:

1. The Contractor shall remove residue from concrete mixing wash-out from all landscape, walkways, curbs, driveways, and similar surfaces to the satisfaction of the Owner.
2. Wash-outs shall not occur in areas where runoff is at risk of entering catch basins or other drainage structures. All wash-out locations must be approved by the Owner in advance.

3.3 CURING

A. Normal Conditions

1. All concrete shall be prevented from drying for at least the first 7 days after placing. All slabs shall be cured by spraying on the specified curing compound as per the manufacturer's printed instructions. Concrete walls shall be cured as carefully as the slabs. However, instead of covering the sides with the curing compound, it would be satisfactory if the forms were "loosened after the concrete had hardened" and the wall sprinkled with water frequently for at least five (5) days allowing the water to flow down the sides between the forms and the concrete. After the five-day wetting the forms may be removed. Curing compounds which discolor the concrete are not permitted.

B. Cold Weather Conditions

1. Whenever the temperature of the surrounding air is below 40 degrees F, all concrete shall be maintained at a temperature of not less than 50 degrees F for at least 72 hours and shall be protected from freezing for at least another 72 hours, or for as much time as is necessary to insure proper curing of the concrete. The housing, covering or other protection used in connection with the curing shall remain in place and intact for at least 24 hours after the artificial heating is discontinued. No dependence shall be placed on salt or other chemicals for the prevention of freezing. The approved practice for Winter Concreting are those outlined in ACI 306.

C. Alternates

1. Methods of curing other than those specified above shall be approved by the Engineer before being used.

3.4 FINISHING CONCRETE

A. Defective Concrete:

1. Any concrete which is not formed as shown on the plans or for any reason is out of alignment or level, or shows a defective surface shall be corrected or replaced as directed by the Engineer.
2. Repair all surface defects and tie holes immediately after form removal.
3. Remove honeycombed or otherwise defective concrete to sound concrete with square cut edges to avoid feathering.

B. Patching:

1. Immediately after removing the forms, all concrete surfaces shall be inspected and any poor joints, voids, stone pockets or other defective areas and all tie holes shall at once be patched before the concrete is thoroughly dry. The patching shall be done in such a manner that it shall form a homogeneous part, in appearance, and action of the main concrete. Fins shall be removed and patched as required where concrete is exposed.

C. Exposed Concrete:

1. All exposed concrete finish shall be as produced through the use of new smooth plywood or metal forms.

D. Rubbing:

1. Smooth rubbed finish shall be provided for exposed surfaces including walls and spandrels.
2. Smooth rubbed finish shall be produced on green concrete. All necessary patching shall be done immediately after forms have been removed and rubbing shall be completed not later than the following day. Surfaces shall be wetted and rubbed with carborundum brick or other abrasive until a uniform color and texture is produced. No cement grout or slush shall be used other than the cement paste drawn from the green concrete itself by the rubbing process.

E. Float Finish: Apply float finish, defined in ACI 301, to surfaces indicated, to surfaces to receive trowel finish.

F. Trowel Finish: Apply a trowel finish to surfaces indicated and to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin film-finish coating system.

- G. After apply float finish, apply first trowel finish and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighen until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
- H. Finish and measure surface so gap at any point between concrete surface and an unveled free-standing 10-foot long straightedge, resting on two high spots and placed anywhere on the surface, does not exceed the following: 1/8 inch.
- I. Trowel and Fine-Broom Finish: Apply a partial trowel finish, stopping after second troweling, to surfaces indicated and to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. Immediately after second troweling, and when concrete is still plastic, slightly scarify surface with a fine broom.

3.5 FIELD QUALITY CONTROL

- A. Concrete Tests: Conduct the following minimum tests in accordance with the requirements of ACI 301, Section 16.3.
 - 1. Strength Test:
 - a. Mold and cure five (5) cylinders from each sample. Test one at 7 days for information and three (3) at 28 days for acceptance. Retain one (1) cylinder for potential 56-day compressive testing and/ or petrographic examination.
 - 2. Slump Test: Conduct test for each strength test sample and whenever consistency of concrete appears to vary.
 - 3. Air Content: Conduct test from one of first three batches mixed each day and for each strength test sample.
- B. Acceptance of Concrete:
 - 1. The strength level of concrete will be considered satisfactory so long as the average of all sets of three consecutive strength test results equals or exceeds the specified 28-day strength and no individual strength test result falls below the specified strength by more than 200 psi.
 - 2. Upon failure of test cylinder results, the Owner may require the Contractor, at his/her expense, to obtain and test at least three 2-inch diameter core samples from the area in question. Conform to ASTM C42. Concrete will be considered adequate if the average of the three cores is at least 85% of, and if no single core is less than 75% of the specified 28-day strength.
 - 3. Upon failure of core test results, the Owner may require the Contractor, at his/her expense, to perform load tests as specified in ACI 318, Chapter 20. Should load tests fail to prove the concrete has reached the required strength; the Contractor shall remove and replace all defective concrete at no additional cost to the Owner. No contract extension will be considered for the time required to remove and replace defective concrete.
 - 4. Fill all core holes as specified for repairing defective concrete.

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END OF SECTION

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CONCRETE REPAIRS

SECTION 03 60 00

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

- A. The General Conditions, and all parts of the Bid and Contract Documents are made part of this Section as if fully repeated herein.
- B. Refer to Division 1, Sections 01 11 00 to 01 77 00 for additional information.

1.2 SCOPE OF WORK

In general, the General Contractor shall supply all labor, transportation, materials, equipment, temporary protection, tools and appliances necessary for the proper completion of the work, as required in the Specifications, in accordance with good construction practice, and as required by the materials manufacturer. The work includes, but is not limited to, the following items:.

- A. Repair cracked or spalled concrete at locations and as indicated in the Contract Documents. Coordinate with Section 01 22 00 – Unit Prices for additional quantities.
- B. Clean all areas affected by the work.

1.3 JOB CONDITIONS

- A. The Contractor shall supply, install and maintain all shoring, supports, barriers, protection, warning lines, lighting and personnel required to support the structure, fixtures and facilities affected by his work and segregate the work area(s) from pedestrian or vehicular traffic, as well as to prevent damage to the building, occupants and the surrounding landscaped and paved areas.
- B. Coordinate the work in this section with the work by other trades to ensure the orderly progress of the work.
- C. Materials which have a temperature other than the application temperatures of the manufacturer shall not be applied.
- D. Under no circumstances shall the Contractor remove existing materials and systems to the ground in an uncontrolled manner. Machinery or devices used shall be manufactured for this purpose. Adjacent building and property areas shall be protected from airborne debris.
- E. During removal operations, the Contractor is responsible for the containment of all dust, dirt, debris, overspray and run-off resulting from the work. The General Contractor shall collect and contain all materials and repair any resulting damage to adjacent surfaces, site fixtures or personal property. Specific attention is drawn to the use of chemicals and cleaners.

1.4 REFERENCES

- A. "Standard Specifications for Structural Concrete" (ACI 301) by American Concrete Institute, herein referred to as ACI 301, is included in total as specification for this structure except where more stringent requirements are shown on Drawings or specified herein.
- B. Comply with provisions of following codes, specifications, and standards except where more stringent requirements are shown on Drawings or specified herein:
 - 1. "Building Code Requirements for Reinforced Concrete" (ACI 318). American Concrete Institute, herein referred to as ACI 318.
 - 2. "Standard Specification for Bonding Hardened Concrete, Steel, Wood, Brick, and Other Materials to Hardened Concrete with a Multi-Component Epoxy Adhesive" (ACI 503.1), American Concrete Institute.
 - 3. "Hot Weather Concreting," reported by ACI Committee 305 (ACI 305R-91).
 - 4. "Cold Weather Concreting" reported by ACI Committee 306 (ACI 306R-88).
 - 5. ICRI: International Concrete Repair Institute.
 - 6. ASTM: American Society of Testing and Materials.

1.5 SUBMITTALS

- A. Submittals shall be made in accordance with the General Conditions and Section 01 33 00 – Shop Drawings and Submittals.

1.6 UNIT PRICES

- A. Refer to the Contract Drawings for known quantities of deteriorated concrete and Section 01 22 00 – Unit Prices for additional quantities. In the event that additional unit price quantities are encountered, the Contractor shall carry the additional renovations outlined in Section 01 22 00 Unit Prices under their contract amount. Only those quantities above what is indicated in the Contract Drawings and Section 01 22 00 – Unit Prices and approved by the Owner will be reimbursed.

1.7 CLEAN-UP

- A. Site clean-up shall be complete and performed daily to the satisfaction of the Owner.
- B. All building (interior and exterior), landscape and parking areas shall be cleaned of all trash, debris and dirt caused by, or associated with, the work.
- C. All trash and debris shall be completely removed from the site daily during the work and at the completion of the work. All debris shall be legally disposed of off-site.

PART 2 - MATERIALS

2.1 CONCRETE PATCHING COMPOUND

- A. Repair mortar for concrete repairs shall be a polymer modified Portland cement based patch mortar. Mortar shall be fast-setting, non-sag material such as Sika Top 123 as manufactured by the Sika Corporation, ThoRoc HB2 manufactured by ChemRex, Inc., Mimic by Conproco or approved equal.

2.2 CONCRETE CRACK REPAIR MATERIALS

- A. Liquid epoxy injection resin for sealing cracks in the concrete deck greater than 1/4" shall be ThoRoc LV 300 as manufactured by ThoRoc, Inc. Products of equal or greater material quality as manufactured by Conproco Corporation, Sika Corporation, Webac America and Deneef America will be considered for acceptance. Material shall be suitable for injection where only one side of the crack is visible. Injection ports, surface sealers and other accessory items required for the proper installation of the work shall be as specifically recommended by the injection grout manufacturer.
- B. Epoxy for sealing surface cracks in the concrete deck less than 1/4" shall be ThoRoc Hi-Mod Epoxy Gel as manufactured by ThoRoc, Inc. Products of equal or greater material quality as manufactured by Conproco Corporation and Sika Corporation will be considered for acceptance.

PART 3 - EXECUTION

3.1 GENERAL WORKMANSHIP

- A. Do not deliver to site or install any material or system that has not been approved. Materials installed without approval may be required to be removed.
- B. Concrete surface must be dry, clean and smooth. Provide dryers, if necessary, to dry concrete surfaces prior to installing new work. Open flame devices shall not be used.
- C. Comply with the manufacturer's written instructions and these Specifications for all renovations and associated work.
- D. Partial or unmarked cans of materials cannot be used.

3.2 CONCRETE SPALL REPAIRS

- A. Remove areas of spalled, cracked, loose or otherwise unsuitable concrete. Define all repair areas with 1/4" deep saw cut. Undercut or "key" in spall repair edges on at least two opposite sides to mechanically retain the repair. Cuts shall not overlap at corners.

- B. Completely remove all dust, grease and other impurities via compressed air and wire brushes, chipping, grinding or other methods as required to achieve an acceptable bonding surfaces.
- C. Prepare the surface of the existing concrete to receive the repair mortar. Dampen the existing surface area with clean potable water. Provide a 1/8" minimum aggressive surface profile with fractured aggregate. Tool marks should be visible.
- D. Apply primer to all bonding surfaces as recommended by the repair mortar manufacturer.
- E. Install repair mortar to properly prepared areas. Mix repair mortar in accordance with the materials manufacturer's instructions. At spall repairs with a depth greater than 1", mix in 3/8" aggregate as required by the mortar manufacturer. Utilize the manufacturer's recommended mix rates. **Do not apply spall repair material over corroded reinforcing.**
- F. The concrete substrates may require wetting with water prior to installing the repair mortar. Consult with the manufacturer's instructions prior to initiating repairs.
- G. Finish the repairs flush with the existing concrete surface. Fast setting concrete repair materials shall cure for a minimum of 2 hours prior to the installation of fasteners or the removal of form work, or as recommended by the materials submitted.
- H. The Contractor will be required to provide all temporary protection of the new and existing concrete that will require curing during the installation process. Any damage as a result of improper protection shall be repaired or replaced at no additional cost to the Owner.

3.3 EPOXY INJECTION REPAIRS

- A. Install tape along perimeters of crack to limit the amount of surface sealer which contacts concrete. Spread surface sealer a minimum of 1/2" past the crack termination. The surface sealer shall have a uniform thickness of 1/8" minimum to 3/16" maximum.
- B. Inject water into cracks to pre-wet the bonding surfaces. While the interior bonding surfaces are still wet, inject grout until clearly visible at the next entry port indicating that crack void is filled to that point. Pressure of injections of grout shall not exceed 200 psi unless instructed otherwise by the Engineer. Injection will begin at the bottom port or lowest port installed in the crack.
- C. Immediately following injection at each entry port, plug port to prevent escape of injected grout.
- D. Repeat until crack void is completely filled. Confine any spills and collect with an absorbent material.
- E. Allow crack repair material to properly cure as recommended by the material manufacturer.

- F. Remove all strippable sealer, tape and associated residue from concrete surfaces, using sharp sided tools such as a putty knife or trowel.

3.4 CLEAN-UP

- A. Prior to acceptance of the masonry work covered in this section, the General Contractor shall perform a thorough clean-up of the work site, building surfaces, landscaping, etc. Any plantings or other items damaged shall be repaired or replaced to the satisfaction of and at no additional cost to the Owner.

END OF SECTION

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MASONRY

SECTION 04 21 00

PART 1 - GENERAL

1.1 IN GENERAL

- A. The General Conditions, and all parts of the Bid and Contract Documents are made part of this Section as if fully repeated herein.
- B. Refer to Division 1, Sections 01 11 00 to 01 77 00 for additional information.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Miscellaneous Metals – Section 05 50 00

1.3 SCOPE OF WORK

In general, the Contractor shall supply all labor, equipment, staging, temporary protection, temporary heat if required, vacuums, generators, tools and appliances necessary for the proper completion of the work in this section.

- A. Cut and point brick masonry mortar joints at locations and as indicated in the Contract Documents. Coordinate with Section 01 22 00 – Unit Prices for additional quantities.
- B. Remove and replace deteriorated brick masonry units at locations and as indicated in the Contract Documents. Coordinate with Section 01 22 00 – Unit Prices for additional quantities.
- C. Clean all surfaces where all masonry renovations and new improvements are performed.

1.4 JOB CONDITIONS

- A. The Contractor shall supply, install and maintain all shoring, supports, barriers, protection, temporary heat, warning lines, lighting and personnel required to support the structure, fixtures and facilities affected by his work and segregate the work area(s) from pedestrian or vehicular traffic, as well as to prevent damage to the building, occupants and the surrounding landscaped and paved areas.
- B. The Contractor shall use dust collection vacuums (HEPA vacuums) to limit airborne dust associated with grinding the existing mortar joints. All costs associated with additional power generators shall be the Contractor's responsibility.
- C. Coordinate the work in this section with the work by other trades to ensure the orderly progress of the work.

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- D. Materials which have a temperature other than the application temperatures of the manufacturer shall not be applied.
- E. Cold Weather Application - (Applies only to rebuilding, no repointing shall be completed when air temperature is less than 40°F). The Contractor shall comply with the following cold weather masonry construction requirements at no change in contract price and shall provide all necessary heat:
1. The cold weather construction and protection requirements shall be closely followed.
 2. Construction materials shall be received, stored, and protected in ways that prevent water from entering the materials.
 3. If climatic conditions warrant, temperatures of construction materials should be measured. Frozen sand and wet masonry units must be thawed. Masonry units below 20°F must be heated above 20°F without overheating.
 4. Sufficient mortar ingredients should be heated to produce mortar temperatures between 40°F and 120°F. Every effort should be made to produce consecutive batches of mortar with the same temperatures falling within this range. The mortar temperature after mixing and before use should be above 40°F, maintainable either by auxiliary heaters under the mortar board or by more frequent mixing of mortar batches. Heated mortar on mortar boards should not become excessively hot (greater than 120°F).
 5. During below-normal temperatures, masonry should be placed only on sound unfrozen foundations. Masonry should never be placed on a snow or ice-covered surface, because of the danger of movement when the base thaws and the possibility of very little bond being developed between the mortar and the supporting surface.
 6. At the end of the day, the top surface of all masonry should be protected to prevent moisture, as rain, snow or sleet, from entering the masonry. This protection must cover the top surface and should extend a minimum of 2 feet down all sides of the masonry.

<u>WORK DAY TEMPERATURE</u>	<u>CONSTRUCTION REQUIREMENT</u>	<u>PROTECTION REQUIREMENT</u>
Above 40°F	Normal masonry procedures.	<i>Cover walls with plastic or canvas at end of work day to prevent water entering masonry.</i>
40°F - 32°F	Heat mixing water to produce mortar temperatures between 40°F - 120°F.	<i>Cover walls and materials to prevent wetting and freezing. Covers should be plastic or canvas.</i>
32°F - 25°F	Heat mixing water and sand to produce mortar temperatures between 40°F - 120°F.	<i>With wind velocities over 15 mph provide windbreaks during day and cover walls and materials at the end of the work day to prevent wetting and freezing. Maintain masonry above freezing for 16 hours using auxiliary heat or insulated blankets.</i>
25°F - 20°F	Mortar on boards should be maintained above 40°F.	

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<u>WORK DAY TEMPERATURE</u>	<u>CONSTRUCTION REQUIREMENT</u>	<u>PROTECTION REQUIREMENT</u>
20°F - 0°F and below	Heat mixing water and sand to produce mortar temperatures between 40°F - 120°F.	<i>Provide enclosures and supply sufficient heat to maintain masonry enclosure above 32°F for 24 hours.</i>

Note: Construction requirements, while work is in progress, are based on *ambient* temperatures. Protections requirements, after masonry is placed, are based on *mean* daily temperatures.

- F. Hot Weather Application – The Contractor shall keep the areas being built sufficiently moist at all times during the operations. Mortar mixed and ready for application shall be used within one hour's time and continually remixed to prevent excessive evaporation of moisture from the mortar. Discard all mortar which has begun to set or is not used within two hours time. Water for tempering shall be available at all times.
- G. Under no circumstances shall the Contractor remove existing materials and systems to the ground in an uncontrolled manner. Machinery or devices used shall be manufactured for this purpose. Adjacent building and property areas shall be protected from airborne debris.
- H. All areas of existing brick masonry removed shall be replaced or made secure and weathertight during the same day. No building interiors, whether new or existing shall be left exposed to the weather at the end of each workday.
- I. During removal operations, the Contractor is responsible for the containment of all dust, dirt, debris, overspray and run-off resulting from the work. The Contractor shall collect and contain all materials and repair any resulting damage to adjacent surfaces, site fixtures or personal property. Specific attention is drawn to the use of chemicals and cleaners.
- J. Fully charged, inspected and approved fire extinguishers shall be on site at all times. No cutting, grinding or welding of any kind shall proceed without an approved fully charged fire extinguisher.
- K. The general nature, quantity and surface area of the various work items are shown on the Contract Drawings.
- L. The Contractor shall provide a dust proof site during the course of the work. Wet cutting methods, dust tight staging and enclosures as well as other methods shall be employed as necessary to meet this requirement.

1.5 SITE PROTECTION

- A. The building and site areas are required to be totally protected in the masonry repair work areas by installing a layer of rigid board insulation followed by a layer of plywood. Plywood shall be adequately ballasted to prevent wind uplift of the plywood. It is the intent to have all masonry work performed prior to the repair of fire escape components.

- B. The Contractor is responsible for the prompt repair of any damage to the existing building or site from the work at the project at no additional cost to the Owner.

1.6 DIMENSIONS AND QUANTITIES

All dimensions and quantities shall be determined or verified by the Contractor. The Contract Drawings have been compiled from various sources and may not reflect the actual condition at the moment of construction. The Contractor is cautioned to take all precautions and make all investigations necessary to install the proposed work. The Owner will not consider unfamiliarity with the job conditions as a basis for additional compensation.

1.7 SUBMITTALS

- A. Submittals shall be made in accordance with the General Conditions and Section 01 30 00, Shop Drawings and Submittals.
- B. The Contractor shall submit the following items with their submittal package.
1. Methods of removal of materials
 2. Temporary protection procedures
 3. Staging/set-up procedures
 4. Program for containment of cleaning chemicals
 5. Shop drawings of Granite materials showing layout and dimensions.
- C. Submit a range of brick masonry units to match the existing color, size and texture.
- D. Samples for Verification: For the following:
1. Full-size unit for each different exposed masonry unit and natural stone required, showing the full range of exposed colors, textures, and dimensions to be expected in the completed construction.
 2. Colored mortar samples for each color required, showing the full range of colors expected in the finished construction. Make samples using the same sand and mortar ingredients to be used on Project. Label Samples to indicate types and amounts of pigments used.
- E. Proposed method of providing a dust proof site (dust removal) during masonry demolition work.
- F. Proposed method of protection for adjacent areas including but not limited to, landscaping, pavement, walkways, site plantings, and related sitework from damage.

1.8 TEST AREAS

- A. Before full scale work is commenced, execute the following work for trial work areas to be reviewed by the Owner as to acceptability of color, texture and appearance match with the existing construction. Test areas will be at locations established by the Owner and Engineer:

1. 5 square feet of brick masonry repointing
- B. Prepare, install and cure all materials in accordance with these specifications and the manufacturer's instructions.
- C. Trial areas shall be repeated until acceptable results are obtained. The accepted work shall be a standard for all subsequent work. Areas of masonry repointing shall be allowed to weather for seven (7) days prior to Owner acceptance.

1.9 UNIT PRICES

- A. The Contract Drawings designate specific known quantities of deteriorated masonry components. The Contractor shall carry the additional renovations included within the Unit Price section, under their contract amount in the event that additional deteriorated masonry or mortar is encountered. Only those quantities approved by the Owner will be reimbursed.

1.10 CLEAN-UP

- A. Site clean-up shall be complete and performed daily to the satisfaction of the Owner.
- B. All building (interior and exterior), landscape and parking areas shall be cleaned of all trash, debris and dirt caused by, or associated with, the work.
- C. All trash and debris shall be completely removed from the site daily during the work and at the completion of the work. All debris shall be legally disposed of off-site.

PART 2 – MATERIALS

2.1 SALVAGED MATERIALS AND ITEMS

All building materials, equipment and debris of whatever nature from the portions of the existing structure removed under this project and not designated to be reused or reinstalled shall become the property of the Contractor and legally disposed of off site. The Contractor will be required to place all discarded materials in the appropriate rubbish receptacles for legal disposal by the Contractor.

2.2 BRICK MASONRY

- A. Replacement brick masonry shall conform to ASTM C 216, Grade SW, Type FBS specifications. Brick shall match existing in size, configuration, color and texture. The majority of the brick masonry units appear to be 2-1/4" x 3-1/2" x 7-5/8" in dimension. However, these units vary and will require confirmation prior to ordering.
- B. All brick shall be submitted to the Owner for acceptability as to color and appearance match with the existing brick. The Contractor may be required to submit additional brick samples for approval. No brick shall be purchased or installed until approval by the Owner is obtained.

2.3 MORTAR FOR BRICKS

- A. Mortar for replacing brick masonry shall be Type N, conforming to ASTM C270 specifications and shall match the existing in color, texture and appearance. Mortar shall conform to Parts 8 and 11 E of the BIA Technical Notes.
- B. Mortar for tuck pointing shall be Type N, conforming to ASTM C270 specifications and shall match the existing in color, texture and appearance. Mortar shall be prehydrated and conform to Part 7 of the BIA Technical Notes.
- C. Portland cement shall be Type II (Type III may be used only if previously approved) conforming to ASTM C150, specifications.
- D. Hydrated lime shall conform to ASTM C207, Type S specifications.
- E. Sand shall conform to ASTM C144, amended as follows:

Sieve Size	% Passing (By Weight)
#4	100
#8	95-100
#16	70-100
#30	40-75
#50	20-40
#100	10-25
#200	0-10

- F. Tinting or coloring agent shall be added to the sand, lime cement to color the fully-cured, in-place mortar to match the physical and chemical characteristics and specified requirements of the Type N mortar.
- G. Admixtures - No admixtures shall be allowed.
- H. Water shall be clean, potable tap water.

2.4 MASONRY CLEANERS

- A. Cleaner for newly-installed brick masonry and repointing areas shall be Sure-Kleen 101 lime solvent by Pro-So-Co, Inc., Hydroclean HT 455 by Hydrochemical Techniques, Inc. 200 Lime Solvent as manufactured by Diedrich Technologies, or approved equal. The cleaner shall be specifically recommended by the manufacturers for the removal of stains and efflorescence from brick masonry.
- B. Restoration cleaner for cleaning exterior brick surfaces prior to initiating masonry repairs shall be formulated from mild inhibited acidic ingredients and wetting agents formulated specifically for the removal of atmospheric dirt, carbon and similar stains from brick masonry surfaces. Brick cleaner shall be as manufactured by Pro-So-Co, Inc., Hydrochemical Techniques, Diedrich Technologies or approved equal.

- C. Masking materials shall be commercially available masking or duct tape of appropriate width. Self-adhesive materials shall be completely strippable, leaving no adhesive residue when removed.
- D. Plastic sheet for masking tape areas shall be 4 mil. thick minimum polyethylene sheet of appropriate size to cover the required areas.

PART 3 – EXECUTION

3.1 GENERAL WORKMANSHIP

- A. Follow all applicable local, state and federal requirements regarding construction of scaffolding and protection of the public safety. Specific reference should be made to OSHA Construction Safety Regulations.
- B. Set up of scaffolding or similar access and location of on-site storage areas shall be subject to review and approval by the Owner.
- C. Do not leave any partially completed sections exposed to the elements overnight. Provide all devices (including heaters and insulation) necessary to maintain areas at the correct temperature and humidity for proper curing of mortar.
- D. During freezing weather, the Contractor shall protect all masonry with tarpaulins or other approved material. Masonry materials shall be stacked on platforms and covered, or stored in a manner acceptable to the Owner, to protect them from contact with soil and weather exposure. Materials with stained faces will not be used in the walls.
- E. No masonry work shall be executed when the temperature in the work area has dropped below 40 degrees F unless it is rising. The Contractor shall provide heat and maintain the temperature of masonry materials and protect the completed work from freezing. Protection shall consist of heating and maintaining the temperature of masonry materials to at least 40 degrees F, but not more than 100 degrees F, and maintain an air temperature above 40 degrees F on both sides of completed masonry for a period of at least 72 hours.
- F. Keep covers tightly sealed on all evaporative products to prevent premature curing.
- G. During the removal of any existing component, the Contractor shall report to the Owner any areas of damaged, deteriorated or otherwise unsuitable framing, wood blocking, or wall materials uncovered during the work. Do not cover unacceptable areas until reviewed by the Owner and Engineer. Provide temporary protection to the area in question.
- H. Any wall areas opened for replacement shall receive the new system that day and shall be enclosed with masonry. Should rebuilding of the masonry not be completed, temporary weather protection and shoring for the wall shall be provided by the Masonry Contractor at no additional charge to the Owner.

- I. If needed, the Contractor shall lay-up replacement brick masonry units plumb, level, and true to the lines and dimensions at the existing walls. Chipped or broken units shall not be used. If any such units are placed in the finished wall, they shall be removed and replaced with new units at no additional cost to the Owner.
- J. The removal and replacement of individual brick masonry units and locations of repointing are included in the Base Bid at the locations shown on the Contract Drawings, and as specified in the Unit Price Section. Only those additional brick masonry units designated by the Owner will be paid for at the Unit Price. The Contractor must confirm additional unit price items with the Owner prior to performing the work should compensation be desired. Adjacent bricks damaged or removed as a result of the work will be removed and replaced at no cost to the Owner.
- K. All shoring of the brick masonry components will be the responsibility, of the Masonry Contractor. Maximum spacing of temporary shoring shall be 12" on center. Any damage as a result of insufficient shoring shall be repaired or replaced at no additional cost to the Owner.
- L. Refer to Brick Industry Association (BIA) technical notes for standard practice for masonry repointing, rebuilding and repair.

3.2 MASONRY STORAGE

- A. Storage of all masonry shall be in the areas designated by the Owner. All stored masonry units shall be covered.

3.3 REMOVAL OF BRICK MASONRY

- A. Remove brick masonry units in the locations shown on the Contract Drawings. Use hand and power tools to remove masonry. Pneumatic demolition tools are not permitted.
- B. Saw-cut surrounding mortar joints and remove the designated masonry units. Remove adjacent units as required. Provide temporary shoring and protection as necessary.
- C. Remove masonry units in a manner so as not to damage sound materials designated to remain.

3.4 REPOINTING

- A. Any masonry unit damaged during the repointing process shall be replaced by the Contractor at no additional cost to the Owner. Repoint the deteriorated brick masonry mortar joints as designated on the Contract Drawings.
- B. Cut and point all brick masonry mortar joints designated to be repointed.

- C. Refer to Technical Notes, Section 7 of the Brick Industry Association concerning methods and materials for tuck pointing repairs.
- D. Remove existing mortar to a depth of at least $\frac{3}{4}$ " in the areas to be repointed. Removal shall be accomplished using hand and power tools so as not to damage the existing brick. Remove both horizontal and vertical joints. Brush the joint clean of all loose mortar and dust and wet the exposed surface down with a light water spray. Keep exposed surface damp throughout procedure.
- E. Utilize rotary mixers when fabricating mortar. Be sure to maintain relative proportions of mortar materials to provide the texture and color to match the existing mortar. No antifreeze compounds or other substances shall be added to the mortar. Mix dry ingredients before adding water. Mix all mortar for at least 3 minutes and not more than 5 minutes with the minimum amount of water to produce a workable consistency. The maximum allowable air content of cured mortar shall be 12% by volume. Retempering of mortars that have stiffened because of evaporation of water will be allowed in order to provide the proper consistency, provided all mortar in a batch is utilized within 2 hours of initial mixing.
- F. Prehydrated mortar shall be used for tuck pointing of masonry. Add only a sufficient amount of water to produce a damp mass of such a consistency that it would retain its form when pressed into a ball with hands but will not flow under a trowel. Allow mortar to stand for not less than 1 hour nor more than 2 hours. Be sure that the color and texture sample of the cured mortar has been viewed and approved by the Owner.
- G. Work mortar into prepared joints for complete width and depth. Consolidate and tool into joint using concave tooling equipment to completely fill the joint cavity and to match the existing joint profile. Repoint any rebuilt masonry areas along with the existing. Repointed masonry shall be raked, or concave as required to match the existing wall mortar joints.
- H. Protect areas of repointing from inclement weather during cure.
- I. Allow repointing areas to fully cure prior to masonry cleaning as described in this section.

3.5 REPLACEMENT OF DAMAGED BRICK

- A. Remove loose, spalled, eroded and cracked brick and replace with new.
 - 1. Loose bricks: bricks that can be moved out of the wall plane by hand pressure or simple hand tools.
 - 2. Spalled and Eroded Brick: brick having an area missing that is at least 2 square inches in area.
 - 3. Cracked brick: brick with a crack on the face that extends from one edge to another edge of the unit.
 - a. Even though there may be more than one crack on a brick face, if none of them extends to another edge the brick is not considered cracked.

- B. Brick units to be removed and replaced shall have the vertical mortar joint, on each side of it, saw cut before the horizontal joints are disturbed.
 - 1. Completely clean out mortar joints to expose the edges of the brick remaining in place.
 - 2. Thoroughly clean all loose brick and mortar dust out of the opening.
- C. Prior to installing new brick, dampen the faces of the opening and moisten the new brick unit.
- D. Place mortar on the ends of the new brick, lay a mortar bed in the opening, and set the new unit in position shoving the mortar bed to level the brick in true alignment and to eliminate any front-to-rear bevel.
 - 1. Shove the vertical joints to equalize joint width on either side. Add, by pointing, additional mortar to develop fully packed vertical joints.
 - 2. Point and hard shove the upper horizontal joint full of mortar.
- E. Tool joints when mortar is "thumb-print hard", or, alternatively, when sufficient water has left the mortar to allow tooling without bringing excessive paste to the surface. Tool the joints, by hard shoving, to a joint profile matching the adjacent brick masonry mortar joints.
- F. Completely remove mortar from brick faces and from adjacent wall, following procedures outlined below in article "Cleaning and Repair".

3.6 MASONRY CLEANING

- A. Perform masonry cleaning to remove algae growth from facades at the locations designated in the Contract Drawings.
- B. Totally clean all repaired, or repointed masonry areas of all construction stains and excess mortar. Do not perform any cleaning until mortar joints and adjacent sealants are fully cured.
- C. Test the specified cleaners on a small area of masonry wall to determine compatibility with the masonry, window units, sealants, etc. Evidence of discoloration, metallic salts or other detritus shall be grounds for requiring the use of a substitute cleaner.
- D. The Contractor will be required to clean the masonry units with the minimum cleaning solution mix ratios as recommended by the cleaner manufacturer. Should the minimum dilution ratios not clean the masonry, the Contractor will be required to slightly decrease the dilution rates to clean the surfaces. It is recommended that the Contractor use care when performing the masonry repairs to prevent increasing the mixing solutions.
- E. Apply the cleaner at the manufacturer's recommended dilution rate and dwell duration. Pre-wet the wall if the manufacturer so recommends.

- F. Allow the cleaner to stand for the manufacturer's recommended dwell period while monitoring to ensure that the surface does not dry. Steel bristle wire brushes are not to be used.
- G. Rinse all cleaner from the wall with water applied at the manufacturer's recommended flow and pressure. High pressure washing equipment may be required. Any acid neutralizing agent required by the manufacturer shall be applied as part of this rinse. Ensure that effluent does not accumulate at ground level, and fully rinse all effluent from sidewalks, streets and landscaping each day.
- H. The Contractor must provide sufficient site protection to prevent the cleaning effluent from draining into the adjacent storm drains. The Contractor will provide a narrative as to how the site protection will be performed.

3.7 CLEAN-UP

Prior to acceptance of the masonry work covered in this section, the Contractor shall perform a thorough clean-up of the work site, building surfaces, landscaping, etc. Any plantings or other items damaged shall be repaired or replaced to the satisfaction of and at no additional cost to the Owner.

END OF SECTION

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MISCELLANEOUS METALS

SECTION 05 50 00

PART 1 - GENERAL

1.1 IN GENERAL

- A. The General Conditions, and all parts of the Bid and Contract Documents are made part of this Section as if fully repeated herein.
- B. Refer to Division 1, Sections 01 11 00 to 01 77 00 for additional information.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Cast-In-Place Concrete – Section 03 30 00
- B. Masonry – Section 05 50 00
- C. Exterior Painting – Section 09 90 00
- D. Asphalt Paving – Section 32 12 16

1.3 SCOPE OF WORK

In general, the Contractor shall supply all labor, equipment, staging, temporary protection, temporary heat if required, vacuums, generators, tools and appliances necessary for the proper completion of the work in this section.

General:

- A. Furnish and install eight-inch (8") diameter bollards at locations and as indicated in the Contract Documents. Coordinate with Section 03 30 00 – Cast-In-Place Concrete and Section 32 12 16 – Asphalt Paving.
- B. Furnish and install new through-bolts and expansion bolts at locations and as indicated in the Contract Documents.
- C. Clean all surfaces where new improvements are performed.
- D. Coordinate with Section 09 90 00 – Exterior Painting.

Cardinal O'Connell School:

- A. Furnish and install replacement stair handrail and associated components at locations and as indicated in the Contract Documents.
- B. Furnish and install new steel angle components at locations and as indicated in the Contract Documents.

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- C. Drill new fastener holes through existing steel components and furnish and install new through-bolts or expansion bolts at locations and as indicated in the Contract Documents.

Green School:

- A. Remove and replace deteriorated steel angles at locations and as indicated in the Contract Documents.
- B. Remove and replace damaged stair tread in like kind at location and as indicated in the Contract Documents.
- C. Furnish and install supplemental steel angle and plate components at locations and as indicated in the Contract Documents.
- D. Remove and replace deteriorated or missing J-bolts at locations and as indicated in the contract Documents.

Molloy School:

- A. Furnish and install supplemental steel angle components at locations and as indicated in the Contract Documents.
- B. Drill new fastener holes through existing steel components and furnish and install new expansion bolts at locations and as indicated in the Contract Documents.

Moody School:

- A. Furnish and install replacement landing grate and associated components at locations and as indicated in the Contract Documents.

Washing School:

- A. Design and install shoring to support the fire escape channels on either side of the existing three-inch (3") diameter column to be removed and reinstalled.
- B. Carefully remove, store and reinstall existing grate and a portion of the support angle as required to install the reinforcement plate at locations and as indicated in the Contract Documents.
- C. Furnish and install replacement stair stringer, treads and associated components at locations and as indicated in the Contract Documents. Coordinate with Section 03 30 00 – Cast-In-Place Concrete for the installation of new Sonotube footings at the extent of the stair stringers.
- D. Remove and replace deteriorated steel angle at existing stair stringer to channel connection at the location and as indicated in the Contract Document.

1.4 JOB CONDITIONS

- A. The Contractor shall supply, install and maintain all shoring, supports, barriers, protection, temporary heat, warning lines, lighting and personnel required to support the structure, fixtures and facilities affected by his work and segregate the work area(s) from pedestrian or vehicular traffic, as well as to prevent damage to the building, occupants and the surrounding landscaped and paved areas.
- B. The Contractor shall use dust collection vacuums (HEPA vacuums) to limit airborne dust associated with grinding the existing mortar joints. All costs associated with additional power generators shall be the Contractor's responsibility.
- C. Coordinate the work in this section with the work by other trades to ensure the orderly progress of the work.
- D. The Contractor shall utilize skilled and experienced specialty workers to install the work. Experienced trade workers shall be utilized for all aspects of the work.
- E. Sandblasting may be required to achieve the surface preparation required by the coating manufacturer.
- F. When field welding will be required; the Contractor shall use caution in the use of welding equipment. The Contractor shall supply a minimum of two (2) fully charged fire extinguishers and enough fire blankets to protect all combustible surfaces. A fire watch must be provided for a minimum of one (1) hour after completion of welding. Contractor is responsible for the cost associated with providing a fire watch and the cost will not be reimbursed by the Owner.
- G. Welding must be performed with the electric arc process (where applicable) and in accordance with AWS "Code for Arc and Gas Welding in Building Construction."

1.5 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only,

- A. AISC 326-02 Detailing for Steel Construction
- B. ASTM A36 Standard Specification for Carbon Structure Steel
- C. ASTM A307-10 Specification for Carbon Steel Bolts and Studs, 60000PSI Tensile Strength
- D. ASTM A563-07a Specification for Carbon and Alloy Steel Nuts
- E. ASTM F844-07a Specification for Washers, Steel, Plain (Flat), Unhardened for General Use

- F. AWS A2.4 Standard Symbols for Welding, Brazing and Nondestructive Examination
- G. AWS D1.1 Structural Welding Code – Steel

1.6 DIMENSIONS AND QUANTITIES

All dimensions and quantities shall be determined or verified by the Contractor. The Contract Drawings have been compiled from various sources and may not reflect the actual condition at the moment of construction. The Contractor is cautioned to take all precautions and make all investigations necessary to install the proposed work. The Owner will not consider unfamiliarity with the job conditions as a basis for additional compensation.

1.7 SUBMITTALS

Shop Drawings and Submittals shall be made in accordance with the General Conditions and Section 01 33 00. In addition, the following shall be submitted;

- A. Drawings: Shop and erection details of all framing elements including members (with their connections) not shown on the Contract Drawings. Welds shall be indicated by standard welding symbols in accordance with AWS A2.4.
- B. Certificates: Certified copies of welder qualifications test records showing qualification in accordance with AWS D1.1.
- C. Testing Report: All existing metal that requires welding shall be sampled and tested to determine required electrode. Testing Reports shall be submitted to the Engineer for review prior to field welding.

1.8 QUALITY ASSURANCE

- A. Erector Qualifications: A qualified installer who participates in the AISC Certification program and is designated an AISC Certified Erector.
- B. Fabricator Qualifications: A qualified fabricator who participates in the AISC Certification program and is designated an AISC Certified Plant.
- C. Comply with applicable provisions of AISC 303
- D. Contractor shall be responsible for correctness of detailing, fabrication and for the correct fitting of members. Connections for any part of the replacement stairs, grating or components not shown in the Contract Drawings shall be considered simple shear connections and shall be designed and detailed in accordance with pertinent provisions of AISC. Substitution of sections or modification of connection details will not be accepted unless approved by the Engineer. Welding shall be in accordance with AWS D1.1.
- E. Applicable Codes:

1. American Iron and Steel Institute (AISI)
2. American Welding Society (AWS)

1.9 CLEAN-UP

- A. Site clean-up shall be complete and performed daily to the satisfaction of the Owner.
- B. All building (interior and exterior), landscape and parking areas shall be cleaned of all trash, debris and dirt caused by, or associated with, the work.
- C. All trash and debris shall be completely removed from the site daily during the work and at the completion of the work. All debris shall be legally disposed of off-site.

1.10 GUARANTEES

Upon completion of the work and prior to final payment, the Contractor shall submit a guarantee of their work as free from defect in materials and workmanship. The guarantee shall be for a period of two (2) years. The guarantee shall be signed by an officer of the Contractor's firm and sealed if a corporation.

PART 2 – MATERIALS

2.1 METAL SECTIONS

- A. In general, provide materials with smooth surfaces without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Where surfaces require reinforcement plates, provide ASTM A36 galvanized structural steel plates and coordinate the size as indicated in the Contract Drawings. Coordinate coating prior to installation.
- C. Metal channels, stringers, angles, plates and bars shall match the historic metal. Sample and test the existing metal requiring repair/replacement to determine the chemical composition. Submit test results to the Engineer for review.
- D. Electrodes for Welding: comply with most current AWS code. Sample and test existing metal requiring welding to determine required electrode. Submit test results to Engineer for review.

2.2 CONNECTIONS

- A. Fasteners for plates or angle surface mounted to brick masonry shall be 3/8" diameter, fully threaded AISI 304 or 316 stainless steel sleeve anchor such as Lok-Bolt AS as manufactured by DeWalt or approved equal. Anchor shall be sufficient length for a minimum eight-inch (8") embedment set in 100% solids, solvent free, moisture-tolerant, high-modulus, high-strength, structural epoxy paste adhesive confirming to ASTM C881, Types I and IV, Grade-3, Class B/C.

- B. Fasteners for plates or angle surface mounted to concrete shall be flat head power-bolt assembly as manufactured by DeWalt or approved equal. Anchor shall be stainless steel conforming to AISI 304 and in accordance with ASTM A 167, Type #1, #7, #31, etc.

2.3 SEALANT

- A. Sealant at perimeter of new surface mounted plates and angles shall be a two-component, polyurethane based, elastomeric sealant complying with ASTM C-920, Type M, Grade NS, Class 25, uses NT, M, G and O as manufactured by BASF-Sonneborn, Sika Corporation or approved equal. Color to be approved by the Owner.

2.4 BOLLARDS

- A. Bollards are to be 8" diameter premanufactured concrete filled galvanized steel. Bollards are to be painted a color as approved by the Owner.

PART 3 – EXECUTION

3.1 FABRICATION

- A. Codes and Standards: Comply with the latest provisions of the following:
 - 1. AISC 303 Code of Standard Practices for Steel Buildings and Bridges.
 - 2. AWS Structural Welding Code – Steel D1.1
- B. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicted on final shop drawings.
- C. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.
- D. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.
- E. Cut, drill or punch holes perpendicular to metal surfaces. Do not flame-cut holes or enlarge holes by burning.

3.2 ERECTION

- A. Erection of steel elements shall be in accordance with the applicable provisions of AISC.
- B. Preparation of Existing Members: Coordinate with Section 09 90 00 – Exterior Painting and verify that the existing framing member to receive supplemental

strengthening has been prepared to receive the supplemental strengthening member. Existing paint, coating and debris should be removed from all mating surfaces.

- C. Field Assembly: Set strengthening members accurately to lines and elevations indicated. Align and adjust various members before permanently fastening. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
- D. Coordinate with Section 04 21 00 – Masonry to provide a solid substrate for anchor embedment.
- E. Temporary Shoring and Bracing: Contractor to design and provide temporary shoring and bracing of members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made.
- F. Apply a sealant cant bead at the perimeter of all support penetrations.
- G. All personnel shall be currently certified for the welding which they perform.
- H. Splice members only where indicated and accepted on shop drawings.
- I. Touch-up Painting: Immediately after erection, clean field welds and abraded areas of the shop coating. Apply paint to exposed areas using same material as used for shop painting.

3.3 QUALITY CONTROL

- A. Any material or workmanship which is rejected by the Engineer either in the mill, shop or field shall be replaced promptly to the satisfaction of the Engineer at no additional cost to the Owner.
- B. Corrective Work:
 - 1. Assemblages having fabrication errors which exceed permissible tolerances, or which inspections or laboratory test reports have indicated to be not in compliance with specifications, shall not be allowed in the finished work. Such members or assemblages may be corrected if permitted by the Engineer and Owner.
 - 2. Perform additional test, at the Contractor's expense, as may be necessary to reconfirm any non-compliance of original work, and as may be necessary to show compliance of corrected work.
 - 3. Corrective work is to be done preferably in the shop and in accordance with AISC and AWS requirements. When requested by the Engineer, submit shop drawings, "for approval", showing details of proposed corrective work.

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END OF SECTION

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PAINTING FILED SUB-BID REQUIREMENTS

SECTION 09 00 01

PART 1 - GENERAL

1.1 IN GENERAL

- A. Attention is directed to all Sections of DIVISION 00 – PROCUREMENT CONTRACTING REQUIREMENTS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS, which are hereby made a part of this Section of the specifications.
- B. Work of this Section requires Filed Sub-Bids and is governed by the provisions of the Massachusetts General Laws (MGL), Public Bidding Law – Chapter 149, Sections 44A to 44J inclusive, as amended and applicable Sections of the MGL, Public Contract Law – Chapter 30.
- C. Specification requirements for the Filed Sub-Bid “Painting” include all of the following listed Specification Sections, in their entirety:
 - 1. Summary of Work – 01 10 00
 - 2. Unit Prices – 01 22 00
 - 3. Exterior Painting – 09 90 00
- D. The work to be completed by the “Painting” Filed Sub-Contractor is identified in the Contract Drawings.

Examine all Drawings and other Sections of the Specifications for requirements therein affecting the Work of this Filed Sub-Contract.
- E. “Painting” is stipulated as a Filed Sub-Bid under PART E, Item 2 of the FORM FOR GENERAL BID.
- F. All Sub-Bids shall be submitted on the FORM FOR SUB-BID furnished by the Awarding Authority, as required by Section 44F of Chapter 149 of the Massachusetts General Laws, as amended, accompanied with the required bid deposit.
- G. Sub-bids for work under this Section shall be for the complete work and shall be filed in a sealed envelope with the Awarding Authority at a time and place as stipulated in the INVITATION FOR BIDS.

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1. The following shall appear on the upper left-hand corner of the envelope:

NAME OF SUB-BIDDER: _____

SUB-BID FOR TRADE: _____

H. Specific information relating to sub-bidders is set forth in the Contract Documents, under the heading "INSTRUCTIONS TO BIDDERS", Including Sub-Bidders" and the attention of sub-bidders is directed thereto.

I. Reference Drawings: The work of this Filed Sub-Bid is shown on the following Contract Drawings:

G100 Cover Sheet
A101 Cardinal O'Connell School Fire Escape Plans
A102 Cardinal O'Connell School Fire Escape Plans
A103 Green School Fire Escape Plans
A104 Green School Fire Escape Plans
A105 Green School Fire Escape Plans
A106 Molloy School Fire Escape Plans
A107 Moody School Fire Escape Plans
A108 Moody School Fire Escape Plans
A109 Washington School North Fire Escape Plans
A111 Washington School South Fire Escape Plans
A201 Cardinal O'Connell School Fire Escape Elevations and Detail Photos
A202 Green School Fire Escape Elevations and Detail Photos
A203 Molloy School Fire Escape Elevations and Detail Photos
A204 Moody School Fire Escape Elevations and Detail Photos
A205 Washington School North Fire Escape Elevations and Detail Photos
A206 Washington School South Fire Escape Elevations and Detail Photos
A501 Details
A502 Details

1.2 EXAMINATION OF SITE AND DOCUMENTS

A. Bidders are expected to examine and to be thoroughly familiar with all contract documents and with the conditions under which work will be carried out. The Awarding Authority (Owner) will not be responsible for errors, omissions and/or charges for extra work arising from General Contractor's or Filed Sub-Contractor's failure to familiarize themselves with the Contract Documents or existing conditions. By submitting a bid, the Bidder agrees and warrants that he has had the opportunity to examine the site and the Contract Documents, that he is familiar with the conditions and requirements of both and where they require, in any part of the work a given result to be produced, that the Contract Documents are adequate and that he will produce the required results.

1.3 QUALITY ASSURANCE

A. Company specializing in work described in the above listed individual specification sections with minimum 5 years documented experience.

1.4 SEQUENCING

- A. Coordinate work of this Filed-Subcontract with that of other trades, affecting or affected by this work, and cooperate with the other trades as is necessary to assure the steady progress of work.
- B. Do not order or deliver any materials until all submittals, required in the listed Specification Sections included as part of this Filed-Subcontract, have been received and approved by the Engineer.
- C. Before proceeding with installation work, inspect all project conditions and all work of other trades to assure that all such conditions and work are suitable to satisfactorily receive the work of this Section and notify the Engineer in writing of any which are not. Do not proceed further until corrective work has been completed or waived.

1.5 INSTALLER'S WARRANTY

- A. In addition to other specified warranties, both in the Conditions of the Contract and in individual Sections of this Filed Sub-bid, the Filed Sub-Contractor will be held responsible for the satisfactory performance of all products installed under this trade for a period of two years. All deficiencies in products provided under this trade and related components which do not meet the specifications are to be corrected promptly at no expense to the Owner during the warranty period.

PART 2 – PRODUCTS

2.1 SCAFFOLDS AND STAGING

- A. Normal access to the work areas will be provided by the General Contractor for use by all Sub-Contractors. Portable ladders and mobile platforms required for use by this Filed Sub-Contractor, shall be provided by this Filed Sub-Contractor.

2.2 HOISTING MACHINERY AND EQUIPMENT

- A. All hoisting equipment, rigging equipment, dumpsters, generators, crane services and lift machinery required for the work by this Filed Sub-Contractor shall be furnished and maintained by this Filed Sub-Contractor. Equipment shall be operated in safe conditions by the Filed Sub-Contractor trained and certified for use of such equipment.

PART 3 – EXECUTION

NOT USED

END OF SECTION

EXTERIOR PAINTING

SECTION 09 90 00

(Part of Work of Section 09 00 01 – PAINTING, FILED SUB-BID REQUIRED)

PART 1 - GENERAL

1.1 IN GENERAL

- A. The General Conditions, and all parts of the Bid and Contract Documents are made part of this Section as if fully repeated herein.
- B. Refer to Division 1, Sections 01 11 00 to 01 77 00 for additional information.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Miscellaneous Metals – Section 05 50 00

1.3 DESCRIPTION OF WORK

In general, the Contractor and Sub-contractor(s) shall supply all labor, transportation, materials, equipment, temporary protection, tools and appliances necessary for the proper completion of the work, as required in the Specifications, in accordance with good construction practice, and as required by the materials manufacturer. The work includes, but is not limited to, the following items:

General:

- A. Provide temporary protection of the existing building components designated to remain, and to prevent overspray to adjacent areas.
- B. Prime and paint new steel fire escape components including, but not limited to, angles, plates, column caps, through-bolts and expansion bolts.
- C. Clean and restore all areas affected by the work.

Cardinal O'Connell School:

- A. Scrape, prime and paint 100% of steel fire escape components as indicated in the Contract Documents.

Green School:

- A. Scrape, prime and paint 100% of the steel fire escape components as indicated in the Contract Documents.

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Molloy School:

- A. Scrape, prime and paint 100% of the steel fire escape components as indicated in the Contract Documents.

Moody School:

- A. Scrape, prime and paint 100% of the steel fire escape components as indicated in the Contract Documents.

Washington School:

- A. Scrape, prime and paint steel fire escape components at locations and as indicated in the Contract Documents. Coordinate with Section 01 22 00 – Unit Prices for additional quantities.

1.4 JOB CONDITIONS

- A. The Contractor shall supply, install and maintain all barriers, protection, warning lines, electrical generators, lighting and personnel required to segregate the work area(s) and to prevent damage to the buildings, their occupants and the surrounding landscaped and paved areas. All applicable OSHA and D.L.W.D. requirements shall be observed by the Contractor.
- B. Liquid materials such as solvents and adhesives shall be stored and used away from open flames, sparks, and excessive heat.
- C. The Contractor shall provide and equip as much labor force as is necessary to complete the project within the Contract period and in accordance with the Contract Documents without sacrificing workmanship quality.
- D. The Contractor shall coordinate with the maintenance staff the daily shutdown of all air intake units in the work areas or possibly affected by the construction fumes, odors or air-borne debris. The Contractor will install plastic sheeting and duct tape over the removed equipment opening prior to initiating work each day. The plastic sheeting shall be removed by the Contractor at the end of each work day.
- E. All debris, dust and dirt, shall be swept clean from all exterior and interior surfaces affected by the work. Any interior finishes and floors which are damaged, soiled or affected by the work shall be cleaned, repaired or replaced by the Contractor with a system equal in color, texture, and finish at no additional cost to the Owner.
- F. Any open ducts, grills, thermostats, electric boxes or similar fixtures and items which can be soiled or affected by the work shall be masked, protected and cleaned by the Contractor at no additional cost to the Owner.
- G. SSPC-QP-1 Certification is not a requirement for this project.

1.5 SUBMITTALS

- A. Submit three sets of manufacturer's specifications and complete range of manufacturer's color chips. Cross reference color samples to color schedule as indicated in this Section.
- B. Prepare samples as requested by the Engineer.
- C. For each type of coating, sealant, or other product furnished, submit data from the manufacturer's paint laboratory indicating that the product conforms to requirements of the referenced specification.
- D. Submit Manufacturer's material safety data sheets for coatings, solvents, and other potentially hazardous materials.
- E. If a product proposed for use does not conform to requirements of the referenced specification, submit for approval to the Owner, evidence from the paint manufacturer's laboratory that the proposed product is either equal to or better than the product specified. The submittal shall include the following:
 - 1. Identification of the proposed substitute;
 - 2. Reason why the substitution is necessary;
 - 3. A comparative analysis of the specified product and the proposed substitute, including tabulations of the composition of pigment and vehicle;
 - 4. The differences between the specified product and the proposed substitute; and
 - 5. Other information necessary for an accurate comparison of the proposed substitute and the specified product.

1.6 REFERENCES

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

AMERICAN CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS (ACGIH)

ACGIH TLV-BKLT	(1991-1992) Threshold Limit Values (TLVs) for Chemical Substances and Physical Agents and Biological Exposure Indices (BEIs)
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ACGIH TLV-DOC	Documentation of Threshold Limit Values and Biological Exposure Indices
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AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D 7396	(2014) Preparation of Zinc-Coated (Galvanized) Steel Surfaces for Painting
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CODE OF FEDERAL REGULATIONS (CFR)

29 CFR 1910.1000	Air Contaminants
29 CFR 1910.1025	Lead
29 CFR 1926.62	Lead Exposure in Construction

COMMERCIAL ITEM DESCRIPTIONS (CID)

CID A-A-2246	Paint, Latex (Gloss, Interior)
CID A-A-2336	(Rev. A) Primer Coating (Alkyd, Exterior Wood, White and Tints)
CID A-A-2904	Thinner, Paint, Mineral Spirits, Regular and Odorless
CID A-A-2994	Primer Coating, Interior, for Walls and Wood
CID A-A-3067	Paint, Alkyd, Exterior, Low VOC
CID A-A-50557	Primer, Water-Borne, Acrylic or Modified Acrylic, For Metal Surfaces
CID A-A-50570	Paint, Water-Borne, Acrylic or Modified Acrylic, Semigloss, for Metal Surfaces

FEDERAL STANDARDS (FED-STD)

FED-STD-313	(Rev. C) Material Safety Data, Transportation Data and Disposal Data for Hazardous Materials Furnished to Government Activities
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FEDERAL SPECIFICATIONS (FS)

FS TT-P-19	(Rev. D; Am. 1) Paint, Latex (Acrylic Emulsion, Exterior Wood and Masonry)
FS TT-E-489	(Rev. J) Enamel, Alkyd, Gloss, Low VOC Content
FS TT-P-641	(Rev. G; Am. 1) Primer Coating, Zinc Dust-Zinc Oxide (For Galvanized Surfaces)
FS TT-P-664	(Rev. D) Primer Coating, Alkyd, Corrosion-Inhibiting, Lead and Chromate Free, VOC-Compliant

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC Guide 6	(1995) Containing Debris Generated During Paint Removal Operations
SSPC Guide 7	(1995) Disposal of Lead-Contaminated Surface Preparation Debris
SSPC PA 1	(1991) Shop, Field, and Maintenance Painting
SSPC PA 3	(1995) Safety in Paint Application
SSPC VIS 3	(1995) Visual Standard for Power-and Hand-Tool Cleaned Steel (Standard Reference Photographs)
SSPC SP 1	(1982) Solvent Cleaning
SSPC SP 2	(1995) Hand Tool Cleaning
SSPC SP 3	(1995) Power Tool Cleaning
SSPC SP 12	(1995) Surface Preparation and Cleaning of Steel and Other Hard Materials by High-and Ultrahigh-Pressure Water Jetting Prior to Recoating
SSPC Paint 20	(1991) Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic")
SSPC Paint 23	
SSPC Paint 104	(1991) White or Tinted Alkyd Paint

1.7 PACKAGING, LABELING, AND STORAGE

- A. Paints shall be in sealed containers that legibly show the contract specification number, designation name, formula or specification number, batch number, color, quantity, date of manufacture, manufacturer's formulation number, manufacturer's directions including any warnings and special precautions, and name and address of manufacturer. Pigmented paints shall be furnished in containers not larger than 5 gallons. Paints and thinners shall be stored in accordance with the manufacturer's written directions, and as a minimum, stored off the ground, under cover, with sufficient ventilation to prevent the buildup of flammable vapors, and at temperatures between 40 to 95 degrees F. Volatile liquids will not be stored on site without prior approval from the Owner.

1.8 WARRANTY

- A. Work shall be left complete, free from defects and hereby warranted that it will not discolor, fade, craze or peel off within a period of two (2) year after acceptance. Repair all work developing imperfections in that time at no expense to the Owner.

PART 2 - PRODUCTS

2.1 EXTERIOR PAINTS

- A. All paint materials shall be products of a recognized reliable manufacturer and shall be of the best quality and grade (1st line) for each type. All paint materials shall be lead free.
- B. Paint to be used for coating shall be a 100% acrylic emulsion, water borne, corrosion resistant coating specifically manufactured for use on exterior metal surfaces such as RD Elastometal as manufactured by RD Coatings. Equal materials manufactured by the Thnec Company or LPL Industries will be considered should they meet the performance requirements. Colors shall be as selected by the Owner to match existing coated surfaces, and as described within this Section.
- C. Primer for use over existing paint coatings and bare metal surfaces, shall be rust inhibitive in nature and as required by the paint manufacturer of existing surfaces encountered and shall be specifically manufactured and recommended by the paint manufacturer for the surface being painted.
- D. Paint thinner shall be as recommended by the paint manufacturer.
- E. Unspecified materials: All unspecified materials such as shellac, turpentine, or linseed oils shall be of the "best grade" or "first line" made by reputable, recognized manufacturers and shall bear the labels and be approved by the Designer.
- F. Coatings to be applied in properly prepared steel members shall be as recommended by the paint manufacturer.

PART 3 - EXECUTION

3.1 GENERAL

- A. Surfaces to receive paint shall meet the requirements established by the manufacturer of the paint and these specifications.
- B. Surfaces to receive paint shall be examined and work shall not be started until defects have been corrected.
- C. Verify that all sealants, putties and glazing compounds have cured for the specified time prior to applying new coatings.
- D. Spaces in which painting is being done shall be properly identified with "Wet Paint" signs or closed to traffic until paint is dry.
- E. Install polyethylene sheeting around the building perimeter and on all building openings.

- F. Provide adequate ventilation.

3.2 WORKMANSHIP

- A. Employ skilled mechanics to ensure the very best workmanship. Quality workmanship is required. Materials to be applied by craftsmen experienced in the use of the particular product involved.
- B. All surfaces shall be properly smoothed. All surfaces shall be properly prepared, clean and dry when a coating is applied. Any bare or abraded spots in base coats shall be touched up before next coat is applied.
- C. Protection against fire shall be taken and all oily rags or waste must be removed from the building each day.
- D. Color of each coat of paint shall be reviewed and accepted by the Owner as it goes on and prior to subsequent applications. Unless otherwise noted, all surfaces to be painted shall receive one prime coat, and two finish coats, or as required to provide a uniform appearance.

3.3 ENVIRONMENTAL CONDITIONS:

- A. Air and surface temperatures shall be between 50°F and 100°F during application of paints and coatings.
- B. Relative humidity shall not be higher than 80%, and surface temperature shall be a minimum of 5°F above the dew point.
- C. Wind velocity shall be less than 15 MPH for exterior painting with no visible atmospheric dust.
- D. Salamanders and open fires are prohibited from the work site.
- E. Surfaces to be painted shall be fully dried, cured, or otherwise set to receive the coatings prior to application.

3.4 PROTECTION OF AREAS AND SPACES

- A. Prior to surface preparation and coating applications, remove, mask, or otherwise protect, hardware, hardware accessories, machined surfaces, radiator covers, plates, lighting fixtures, public and private property, and other such items not to be coated that are in contact with surfaces to be coated. Following completion of painting, workmen skilled in the trades involved shall reinstall removed items. Restore surfaces contaminated by coating materials, to original condition and repair damaged items.

3.5 SURFACE PREPARATION

- A. Items not to be painted which are in contact with or adjacent to painted surfaces shall be removed or protected prior to surface preparation and painting operations. Surfaces to be painted shall be clean before applying paint or surface treatment. Oil and grease shall be removed with clean cloths and cleaning solvents prior to mechanical cleaning. Cleaning solvents shall be of low toxicity with a flashpoint in excess of 100 degrees F. Cleaning shall be programmed so that dust and other contaminants will not fall on wet, newly painted surfaces. Before painting, the Contractor shall remove hardware accessories, plates, and similar items or provide ample protection of such items. Upon completion of each space, the Contractor shall replace above items.
- B. Ferrous Metal: Removal of loose rust, loose mill scale, and loose paint to degree specified, by power tool chipping, scraping, sanding, and wire brushing as necessary to receive paint in accordance with the Structural Steel Painting Council (SSPC-3 Specifications) and the paint manufacturer. Fill dents and depressions with Auto body putty and sand smooth. Touch up any chipped or abraded placed on items that have been shop coated. All welds exposed in finished surfaces to be ground smooth by fabricator. Where steel and iron have a heavy coating of scale, it shall be removed by de-scaling or wire brushing as necessary to produce a satisfactory surface for painting.
- C. Existing coated surfaces with no defects: Before application of coatings, perform the following on surfaces covered by soundly-adhered coatings, defined as those which cannot be removed with a putty knife:
 - 1. Wipe previously painted surfaces to receive solvent-based coatings, clean with a clean, dry cloth saturated with mineral spirits. Allow surface to dry. Wiping shall immediately precede the application of the first coat of any coating, unless specified otherwise.
 - 2. Sand existing enamel and other glossy surfaces to remove gloss. Brush, and wipe clean with a dry cloth.
 - 3. The requirements specified are minimum. Comply also with the application instructions of the paint manufacturer.
- D. Existing Coated Surfaces with Minor Defects: Sand, fill, and treat minor defects to render them smooth. Minor defects are defined as scratches, nicks, cracks, gouges, spalls, alligatoring, chalking, and irregularities due to partial peeling of previous coatings.
- E. Removal of Existing Coatings: Remove existing coatings from the following surfaces:
 - 1. Loose and scaling paint and/or rust shall be removed in order to properly prepare the steel surfaces per the manufacturer's requirements at designated railings and steel ladders;

F. Substrate Repair:

1. Repair substrate surface damaged during coating removal;
2. Sand edges of adjacent soundly-adhered existing coatings so they are tapered as smooth as practical to areas involved with coating removal;
3. Clean and prime the substrate as specified.
1. 6 degree of cleanliness to remove existing coating.

3.6 APPLICATION OF PAINT

- A. Finishing materials shall be free from skins, lumps or any foreign matter when used, and shall be kept well stirred while being applied.
- B. Each finish coat paint shall be evenly applied and allowed to dry before any subsequent coat is applied. Each coat shall be applied in accordance with the manufacturer's requirements and recommendations. The finished work shall be free from runs, sags, defective brushing and clogging of lines or angles. Drying time between coats of paint shall be in accordance with the manufacturer's requirements.
- C. Unless otherwise noted, all surfaces to be painted shall receive the followings
1. Full Prime Coat: RD Elastometal or approved equal to all prepared surfaces at 6.0-7.0 mils dft.
 2. 2-Full Finish Coats: RD Monoguard or approved equal to all primed surfaces at 3.0-4.0 mils dft. Per coat, color to be approved by Owner.
- D. Spray painting will not be allowed unless approved in writing by the Engineer.
- E. All materials shall be applied in accordance with manufacturers' recommendations.
- F. Do not allow primers or intermediate coats to dry more than 30-days, or longer than recommended by manufacturer, before applying subsequent coats. Follow manufacturer's recommendations for surface preparation if primers or intermediate coats are allowed to dry longer than recommended by manufacturers of subsequent coatings. Each coat shall cover surface of preceding coat or surface completely, and there shall be a visually perceptible difference in shades of successive coats.
- G. Apply coatings with approved brushes or approved rollers, unless specified otherwise. Spray areas made inaccessible to brushing by items such as ducts and other equipment.
- H. Reduce paints to proper consistency by adding fresh paint, except when thinning is mandatory for the type of paint being used. Obtain written permission from the Owner to use thinners. The written permission shall include quantities and types of thinners to use.

3.7 CLEAN-UP

- A. All floor and adjacent areas, both interior and exterior, damaged or stained by the installation of the new work shall be repaired and cleaned of all dust, debris and any other materials to the Owner's satisfaction.
- B. The Contractor shall not demobilize the site until the completed work is toured by the Owner and Designer. Any unsatisfactory items observed will be reported in "punch-list" form. These items shall be corrected immediately by the Contractor prior to demobilization from the job site.
- C. All scaffolding, barriers, temporary facilities and the like shall be removed upon completion of the work. Areas damaged as a result of the Contractors equipment shall be restored to their original condition, all to the satisfaction of the Owner.

3.8 INSPECTION AND ACCEPTANCE

- A. In addition to meeting previously specified requirements, demonstrate mobility of moving components, including swinging and sliding doors, and windows with operable sash, for inspection by the Owner. Perform this demonstration after appropriate curing and drying times of coatings have elapsed and prior to invoicing for final payment.

END OF SECTION

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ASPHALT PAVING

SECTION 32 12 16

PART 1 - GENERAL

1.1 IN GENERAL

- A. The General Conditions, and all parts of the Bid and Contract Documents are made part of this Section as if fully repeated herein.
- B. Refer to Division 1, Sections 01 11 00 to 01 77 00 for additional information.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Concrete Formwork – Section 03 10 00
- B. Cast-In-Place Concrete – Section 03 30 00

1.3 DESCRIPTION OF WORK

- A. Work Included: Work under this section includes the installation of bituminous concrete pavement to a total compacted thickness indicated in the Contract Drawings. All existing pavement damaged or displaced as a result of the construction operations will be restored in accordance with the requirements for this Section.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include technical data and tested physical and performance properties.
 - 1. Job-Mix Designs: Certification, by authorities having jurisdiction, of approval of each job mix proposed for the Work.
- B. Shop Drawings: Indicate pavement markings, lane separations, and defined parking spaces. Indicate, with international symbol of accessibility, spaces allocated for people with disabilities.
- C. Material Certificates: For each paving material, from manufacturer.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by the Massachusetts Department of Transportation Highway Division (MassDOT).

- B. Regulatory Requirements: Unless otherwise superseded by this specification, comply with materials, workmanship, and other applicable requirements of the Massachusetts Department of Transportation Highway Division (MassDOT) for hot mix asphalt paving work.
 - 1. Unless otherwise superseded by this specification, comply with requirements of the Massachusetts Department of Transportation Highway Division (MassDOT) Standard Specifications for Highways and Bridges, including supplemental specifications and special provisions.
 - 2. Comply with requirements of the Americans with Disabilities Act (ADA) and the Massachusetts Architectural Access Board (MAAB). If these requirements cannot be met with the grades and slopes indicated on the plans, notify the Engineer immediately.
 - 3. Comply with requirements of the local authority having jurisdiction concerning the location and construction of accessible curb cuts.
- C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01.
 - 1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:
 - a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
 - b. Review condition of subgrade and preparatory work.
 - c. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
 - d. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pavement-marking materials to Project site in original packages with seals unbroken and bearing manufacturer's labels containing brand name and type of material, date of manufacture, and directions for storage.
- B. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.7 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

- B. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:
1. Tack Coat: Minimum surface temperature of 60 deg F.
 2. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
 3. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.
- C. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 55 deg F for water-based materials, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.1 MINERAL AGGREGATE

- A. Conform to subsection 703.07 of the Standard Specifications.

Pavements Coarse aggregate and fine aggregate for hot mix asphalt pavements shall be of such gradation that when combined in the proper proportions, including filler, if required, the resultant blend will meet the composition of mixture for the type of pavement specified.

Coarse aggregate, that material retained on the 2.36 mm [No. 8] sieve, shall be crushed stone or crushed gravel and, unless otherwise stipulated, shall consist of clean, tough, durable fragments free from an excess of soft or disintegrated pieces and free from stone coated with dirt or other objectionable matter.

Fine aggregate, material that passes the 2.36 mm [No. 8] sieve, shall consist of natural sand, manufactured sand, or a combination of these. It shall consist of hard, tough grains, free from injurious amounts of clay, loam, or other deleterious substances. Fine aggregate, shall not exceed an absorption of 3% by weight as determined by AASHTO T84.

The composite blend shall have a Micro-Deval value of 18.0 or less as determined by AASHTO TP58-99. In the event of a failure, the Washington State Degradation test of 1967 shall be run before rejection of the material. Material with a value of 30 or more may be accepted.

Aggregates shall also meet the following consensus properties. The Department reserves the right to sample and test the composite aggregate for any of the following properties at any time.

2.2 BITUMINOUS MATERIALS

- A. Bituminous materials shall conform to the requirements of these Specifications and Section 702 of the Standard Specification.
- B. Bitumen delivered to a project or to a mix plant must be accompanied by a proper

certificate signed by the producer's authorized representative. Shipments of material not accompanied by a certificate will not be accepted for use in the work.

- C. Bituminous Concrete Paving shall confirm to the requirements in Section 403.03 of the Standard Specifications.
- D. Hot Poured Joint Sealer: Sealer shall be composed of a mixture of materials which will form a resilient and adhesive compound capable of effectively sealing joints in concrete and shall conform to the requirements of AASHTO M 173.
- E. Tack coat shall consist of either emulsified asphalt, Grade MS-I conforming to Section 702.04, or cutback asphalt, Grade MC-70 or MC-250 conforming to Section 702.03 of the Standard Specifications.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine exposed Subbase and Base surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
- C. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 COLD MILLING

If applicable, clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.

3.3 PATCHING (If Applicable)

- A. Existing Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.
- B. Existing Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseal concrete pieces firmly.
 - 1. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.
- C. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new,

hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd.

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.
- D. Patching: Fill excavated pavements with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

3.4 SURFACE PREPARATION

- A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.
- B. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd.
1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
 2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.5 HOT-MIX ASPHALT PLACING

- A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand to areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.
1. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.
- B. Place paving in consecutive strips not less than 10 feet wide unless infill edge strips of a lesser width are required.
- C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.
- D. The permanent bituminous concrete pavement surface courses shall be provided in accordance with details and the applicable requirements of Massachusetts Standard Specifications Section 460, Subsection 460.40 and Section M.3.11 for "Materials" and Subsection 460.60 for "Construction Methods". The surface shall be rolled free of any roller marks, ridges, and voids, and shall be repaired if directed.
- E. The temperature of asphalt at time of placement shall be as follows:

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Base Temp °F on which mix is placed	Mat Thickness					
	1/2"	3/4"	1"	1-1/2"	2"	3" +
35-40				305	295	280
40-50			310	300	285	275
50-60		310	300	295	280	270
60-70	310	300	290	285	275	265
70-80	300	290	285	280	270	265
80-90	290	280	275	270	265	260
90+	290	275	270	265	260	255

Temperatures listed above shall be within plus or minus 15° F

3.6 JOINTS

- A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.
 1. Clean contact surfaces and apply tack coat to joints.
 2. Offset longitudinal joints, in successive courses, a minimum of 6 inches.
 3. Offset transverse joints, in successive courses, a minimum of 24 inches.
 4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method according to AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations."

3.7 COMPACTION

- A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.
 1. Complete compaction before mix temperature cools to 185 deg F.
- B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.
- C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:
 1. Average Density: ASTM D 2041
- D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- E. Edge Shaping: While surface is being compacted and finished, trim edges of

pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

- F. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.
- G. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.8 INSTALLATION TOLERANCES

- A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:
 - 1. Base Course: Plus or minus 1/2 inch.
 - 2. Surface Course: Plus 1/4 inch, no minus.
- B. Pavement Surface Smoothness: Compact each course to produce a surface smoothness within the Standard Specification tolerances as determined by using a 10-foot straightedge applied transversely or longitudinally to paved areas.

3.9 FIELD QUALITY CONTROL

- A. Test the plane of the finished surfaces of base, binder, and surface courses with a 16-foot straightedge, except use a 10-foot straightedge on vertical courses and on the top course of resurfaced streets which contain manhole covers, valve boxes, and the like.
- B. Carefully apply the straightedge immediately after the first compaction by rolling, and from then on as may be necessary until and after the final compaction of the material in place. Hold the straightedge in successive positions parallel to the road centerline and in contact with the road surface; check the entire area from one side of the pavement to the other.
- C. Correct irregularities which vary 3/8 inch from a true finished surface in base and binder courses, and 1/4 inch in top courses.
- D. Irregularities which may develop before the completion of rolling and while the material is still workable, may be remedied by loosening the surface mixture and removing or adding material as necessary. Should any unsatisfactory irregularities or defects remain after final compaction, correct the defective work by removing and replacing with new material to form a true and even surface.

3.10 OPENING TO TRAFFIC

- A. No vehicular traffic or loads shall be permitted on the newly completed pavement until adequate stability has been attained, and the material has cooled sufficiently to prevent distortion or loss of fines, and the pavement has achieved a maximum temperature of 140 degrees F.

- B. If the climatic or other conditions warrant it, the period of time before opening to traffic may be extended at the discretion of the Designer.

3.11 DISPOSAL

- A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

END OF SECTION

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